Lower Colorado River
National Wildlife Refuges
Comprehensive Management Plan
1994-2014

FINAL

ENVIRONMENTAL ASSESSMENT

Havasu National Wildlife Refuge
Bill Williams River National Wildlife Refuge
Cibola National Wildlife Refuge
Imperial National Wildlife Refuge

U.S. Fish and Wildlife Service
Region 2
Albuquerque, New Mexico

U.S. Bureau of Reclamation
Lower Colorado Region
Boulder City, Nevada

U.S. FISH AND WILDLIFE SERVICE
ENVIRONMENTAL ACTION MEMORANDUM

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA) and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and have determined that the action of: Implementation of a programmatic Comprehensive Management Plan for the Lower Colorado River National Wildlife Refuges (Havasu, Bill Williams River, Cibola, and Imperial NWRs).

_____ is a categorical exclusion as provided by 516 DM 6 Appendix 1 section B(4). No further documentation will be made.

_____ is found not to have significant environmental effects as determined by the attached Environmental Assessment and Finding of No Significant Impact.

X
_____ is found to have special environmental conditions as described in the attached Environmental Assessment. The attached Finding of No Significant Impact will not be final nor any actions taken pending a 30 day period for public review (40 CFR 1501.4(e)(2)).

_____ is found to have significant effects, and therefore a "notice of Intent" will be published in the Federal Register to prepare an Environmental Impact Statement before the project is considered further.

_____ is denied because of environmental damage, Service policy, or mandate.

_____ is an emergency situation. Only those actions necessary to control the immediate impacts of the emergency will be taken. Other related actions remain subject to NEPA review.

Other supporting documents: **Finding of No Significant Impact, Environmental Assessment for Lower Colorado River National Wildlife Refuges Comprehensive Management Plan**

John G. Rogers 9/19/94
Director/Regional Director Date

(1) Tom Bonn 9/19/94
Initiator Date

(2) [signature] 9/19/94
ARD RW Date

(3) Floyd A. Nudi 9/19/94
NEPA Coordinator/ Region 2 Date

COMPREHENSIVE MANAGEMENT PLAN APPROVAL
for the
Lower Colorado River National Wildlife Refuges:
Havasu NWR
Bill Williams River NWR
Cibola NWR
Imperial NWR

The attached Comprehensive Management Plan for the Lower Colorado River National Wildlife Refuges has been reviewed and approved as submitted by the managers of the aforementioned national wildlife refuges.

Submitted by:

James R. Good — 1-18-94
Jim Good, Refuge Manager — **Date**
Havasu NWR

Nancy Gilbertson — 3/28/94
Nancy Gilbertson, Refuge Manager — **Date**
Bill Williams River NWR

W. Martin — 4/5/94
Wes Martin, Refuge Manager — **Date**
Cibola NWR

Andy Loranger — 4/14/94
Andy Loranger, Refuge Manager — **Date**
Imperial NWR

Joseph P. Mazzoni 9/14/94
Approved by: **Date**
Joseph P. Mazzoni
Assistant Regional Director
Refuges and Wildlife, Region 2

John G. Rogers 9/14/94
Approved by: **Date**
John Rogers
Regional Director, Region 2
U.S. Fish and Wildlife Service

The U.S. Bureau of Reclamation, Lower Colorado Region, has participated in this planning effort as a full Cooperator and hereby approves this Comprehensive Management Plan's treatment of issues pertaining to the Bureau's management responsibilities of lower Colorado River resources.

for Robert W. Johnson — 9/19/94
Approved by: **Date**
Lawrence F. Hancock
Regional Director
Lower Colorado Region
U.S. Bureau of Reclamation

Finding of No Significant Impact

Environmental Assessment and Comprehensive Management Plan Summary

Lower Colorado River National Wildlife Refuges

Havasu National Wildlife Refuge
Bill Williams River National Wildlife Refuge
Cibola National Wildlife Refuge
Imperial National Wildlife Refuge

The U.S. Fish and Wildlife Service has developed a Final Draft Comprehensive Management Plan primarily focusing on four national wildlife refuges along the lower Colorado River: Havasu NWR, Bill Williams River NWR, Cibola NWR, and Imperial NWR. Through an extensive program of consultation and public involvement, the Service has outlined the various problems and opportunities (i.e., issues) confronting these refuges and their surrounding areas. The Comprehensive Management Plan and the Environmental Assessment outline these issues programmatically and how the Service intends to address them over the next twenty years.

Implementation of the Comprehensive Management Plan constitutes a formalization of a set of proposed programmatic objectives for these national wildlife refuges. Based on a review and evaluation of the information contained in the Comprehensive Management Plan and the Environmental Assessment, I have determined that the formal approval of refuge goals and objectives is not deemed a major Federal action which would significantly affect the quality of the human environment within the meaning of Section 102(2) (c) of the National Environmental Policy Act. Therefore, an Environmental Impact Statement is not required. However, it is the intent of the Service to revisit questions of potential significant environmental consequences in accordance with NEPA upon considering the implementation of site specific proposals called for and discussed in any final plan document pertaining to the aforementioned national wildlife refuges.

Regional Director
John Rogers

TABLE OF CONTENTS

ENVIRONMENTAL ASSESSMENT
LOWER COLORADO RIVER NATIONAL WILDLIFE REFUGES
COMPREHENSIVE MANAGEMENT PLAN PROPOSAL

EXECUTIVE SUMMARY

It is the policy of the U.S. Fish and Wildlife Service (Service) that national wildlife refuges will have approved Comprehensive Management Plans to guide refuge management decisions in response to the goals, objectives, and long-range plans of the Service.[1]

This document presents an analysis of the Service's proposal to implement long-range management framework changes on four national wildlife refuges situated along the lower Colorado River (River) in western Arizona and eastern California.[2] These national wildlife refuges include: Havasu, Bill Williams River, Cibola, and Imperial NWRs. This analysis is done with the full cooperation of the U.S. Bureau of Reclamation (BR), Lower Colorado River Region, as partners and sister agencies of the U.S. Department of the Interior. It is the expectation of both the Service and the BR that the implementation of coordinated activities will lead toward the achievement of the respective agency missions.[3]

The Service proposes the adoption of a management framework that considers the four refuges' shared needs as well as their individual needs. This proposed framework would also address management of each of the refuges within the context of a larger "Area of Ecological Concern."[3] (See Figure 1)

Several sources of information indicate that since the 1930's, the natural resource values, especially riparian habitat, have been consistently declining within the refuges and along the entire River. Since that time, the construction of Hoover Dam and a series of smaller dams changed the course of the River and subsequently affected habitat and natural succession. Initially, management of the River for its economic benefits took precedence over any management for protection of intrinsic habitat and wildlife values. Passage of the Fish and Wildlife Coordination Act of 1934, as amended, signaled a new

---

[1]Please refer to Refuge Manual--4 RM 1.1 - 1.6 for a citation of the major objectives of refuge master planning. Also refer to Refuge Manual--2RM 1.1-1.4, the Goals of the National Wildlife Refuge System.

[2]This Environmental Assessment (EA) concerns only the implications of broad management framework changes, and not specific refuge management strategies set out in the Lower Colorado River National Wildlife Refuges Comprehensive Management Plan (CMP). The Goals and Objectives of the CMP are appended to this document. Specific plan objectives and management strategies listed in the CMP may be subject to additional National Environmental Policy Act (NEPA) compliance prior to implementation. However, specific environmental analysis and documentation may tier from this programmatic EA. Because of the broad perspective of this EA, the analysis did not lend itself to quantitative measures. The analysis attempts to narratively describe anticipated measures of change with regard to the issues based upon the alternative management framework discussed.

[3]The mission of the BR is: "To manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public." [*Reclamation's Strategic Plan*, U.S. Bureau of Reclamation, June 1992] The mission of the U.S. Fish and Wildlife Service is: "To provide leadership toward achieving a national net gain of fish and wildlife and the natural systems which support them." [*Vision*, U.S. Fish and Wildlife Service, 1991]

[3]An "area of ecological concern" can be defined as: "An essentially complete ecosystem (or set of interrelated ecosystems) of which one part cannot be discussed without considering the remainder." [Malheur National Wildlife Refuge Master Plan and Environmental Assessment, 1985, pg. 7] For purposes of the lower Colorado River national wildlife refuge master plan, the entire reach between Davis Dam and the Colorado River/Gulf of California (Mexico) delta is considered the "area of ecological concern." This area is larger enough that it encompasses several ecosystems including perennial riparian, intermittent riparian, lucustrine, and desert uplands. The three major riparian systems are the lower Colorado River, Bill Williams River, and the Gila River. Two major desert regions are included: the Mojave and the Sonoran desert regions.

awareness that fish and wildlife values were important elements to be considered by government decision makers. It was not until the passage of other legislation, such as the Endangered Species Act, the National Environmental Policy Act (NEPA), and the Clean Water Act that decision makers began to integrate a myriad of environmental impacts into the decision-making process.

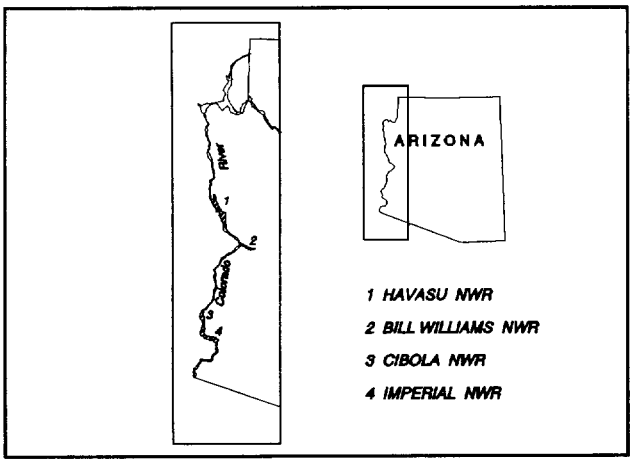


Figure 1 The "Area Of Ecological Concern" is a Large Area Encompassing Several Ecosystems.

These Federal laws, among others, have prompted the consideration of new approaches in planning and management. These approaches recognize that consideration of impacts to wildlife, habitat, and the environment will result in lessening declines in the quality and quantity of our natural resources. These policies also recognize that consideration of environmental impacts results in decisions that are of ultimate benefit to the human community.

The proposed management strategy framework is offered as an alternative to a continuation of the current management framework that focuses on issues inside refuge borders and considers each of the Colorado River refuges as separate management entities.

The large number of Federal agency jurisdictions and activities within the Area of Ecological Concern prompts agencies to improve interagency coordination. The proposed management framework calls for a coordinated approach to implementing goals and objectives for the four lower Colorado River national wildlife refuges, and calls for the other jurisdictions with responsibilities along the River to consider participating with the Service in various joint ventures and cooperative projects for the benefit of fish and wildlife resources in the Area of Ecological Concern.

The Management Framework Alternatives. The following refuge management framework alternatives were considered in the planning process: (A) "Refuges in Ecosystem" Management Framework Alternative (proposed and preferred alternative); (B) the Current Management Framework Alternative (No Action); (C) "Refuges as Autonomous" Management Framework Alternative; and (D) "Combination of Refuges" Management Framework Alternative (Imperial-Cibola National Wildlife Refuges (NWRs) and Havasu-Bill Williams River NWRs). This assessment concludes as follows:

A. "Refuges in Ecosystem" Management Framework Alternative (proposed and preferred). This document asserts that if adopted, the proposed alternative would best address individual refuge needs, needs of the National Wildlife Refuge System, and the need in the Region for greater improvements to interagency coordination in natural resource management and decision-making over the next twenty years. Goals and objectives related to the issues brought forth in the public involvement effort would effect optimum efficiencies in environmental and natural resource management throughout the Area of Ecological Concern and on the refuges.

Because agency and jurisdictional coordination would be maximized, potential conflicts between ecological and economic goals and objectives would be reduced. The proposed

alternative calls for the development of natural resource goals and objectives in consideration of socioeconomic effects to the various urban and rural communities along the "area of ecological concern." One of the projected outcomes of the proposed alternative would be the improvement of "quality of human life" stemming from biological diversity, environmental education, and public outreach. This would contribute to the public's "understanding and appreciation of fish and wildlife ecology and man's role in his environment."[4]

B. Current Management Framework or No Action Alternative. In this alternative, the refuges would make minor revisions to their current goals and objectives. The resulting management strategy would perpetuate the status quo whereby the present trend of habitat fragmentation would continue in the face of increased economic demands placed on the River resource. The No Action alternative would: (1) fail to provide the vehicle for improved coordination among jurisdictions; (2) fail to provide the individual refuges with realistic direction for the future; (3) fail to meet the management expectations of the National Wildlife Refuge System; and (4) fail to directly address the issues brought forth in the public involvement process.

C. "Refuges as Autonomous" Management Framework Alternative. This alternative would encompass a major planning and management implementation effort to establish separate new goals and objectives for each of the refuges. These goals, objectives, and management strategies would be framed around the issues brought forth in the public involvement scoping effort.[5]

While this alternative might suggest improved coordination between the various agencies with jurisdiction on the River, it would also foster outcomes bent on fulfilling goals and objectives designed for each of the refuge's separate needs. Over time, the impetus for interagency and inter-refuge coordination would be lost. As in the case of the "No Action" Alternative, the refuges would continue to compete both regionally and nationally for priority. Resources would continue to be granted to the refuges as separate entities, and this would affect the efficiency of both protection of, and improvements to, the natural resources for the entire River resource.

D. "Combination of Refuges" Management Framework Alternative. This alternative would involve the consideration of the two refuges below Parker Dam (i.e., Imperial and Cibola) as sharing similar hydrological and hydraulic influences, and that the two refuges above Parker Dam and below Davis Dam (i.e., Havasu and Bill Williams River) share similar hydrological and hydraulic influences. Because of these considerations, new goals, objectives, and management strategies would be developed for the refuge

---

[4]Refuge Manual 2 RM 1.4

[5]"Scoping" is defined as the process during which governmental agencies solicit input and involvement from various publics (including other governmental agencies) in an effort to define a range of issues (problems and opportunities) to be addressed by a contemplated government action. That contemplated government action is usually known as a Proposed Action or Proposed Alternative. The Proposed Action, along with alternative strategies, are evaluated with respect to their ability to resolve problems and achieve opportunities without significantly impacting the environment. In accordance with requirements of the National Environmental Policy Act and the Council for Environmental Quality, the analysis is documented in an environmental assessment or impact statement.

combinations. These goals and objectives would be directly related to the issues brought forth in the public involvement process.

Though this alternative provides for consideration of issues on a scale going beyond refuge borders, the long term result would be a competitive relationship between the two combinations. Agency and jurisdictional coordinated efforts might be diminished over the long term. In addition, the focus would eventually change from a broader perspective involving combinations of the four refuges, into a more narrow perspective with parochial strategies that would be less inclusive of other jurisdictional needs.

TABLE OF EFFECTS ON ENVIRONMENTAL ISSUES
Lower Colorado River National Wildlife Refuges
Comprehensive Management Plan Draft Environmental Assessment

Alternatives Issues	Ecosystem Alternative	No Action Alternative	Autonomous Alternative	Combination Alternative
1. Biological Diversity and Habitat Management	4	1	3	3
2. Energy Efficiency	4	1	3	3
3. Ecological Quality	4	1	3	3
4. Visual Quality	4	1	3	3
5. Water Management & Quality	4	1	3	3
6. Native Vegetation	4	1	3	3
7. Wetlands	4	1	3	3
8. Compatibility, Refuge Recreation, Harmful Uses, and Law Enforcement	5	1	3	4
9. Quality of Public Use	5	1	3	4
10. Interagency Coordination and Native American Cooperation	5	0	1	3
11. Cultural Resources	5	1	3	4
12. Socio Economics	5	1	3	4
13. Staffing and Funding	5	1	3	4

The numerical evaluations represent measures of improvement relative to the issues in the matrix. The numerical measures are on a scale of 0 to 5 as follows:

0 = No Improvement; 1 = Little Improvement; 3 = Some Improvement; 4 = strong improvement
5 = optimum improvement

The above table summarizes the discussions in Part V (Environmental Consequences) of this Environmental Assessment. The table summarizes the level of enhancement relative to each of the 13 issues delineated in the Environmental Assessment.

I. INTRODUCTION

A. GENERAL

As demonstrated throughout history, the lower Colorado River basin has clearly played, and continues to play, a defining and central role for desert and riparian ecosystems in western Arizona and eastern California.[6] This is true even though modern technological development beginning in the early 1900's has altered the River basin's natural flows. This, in turn, has affected much of the associated wildlife that gleans sustenance and protection from this oasis in the desert. Dam building, in an effort to control water for energy production, recreation, and agriculture, has produced a set of outcomes that are problematic to both wildlife and human ecology. Ecologists and wildlife managers concede that what remains yet unknown is how much of the Area of Ecological Concern can be managed to optimize natural diversity. It is known, however, that continuing to plan and manage individual elements of the Area of Ecological Concern without respect for the remainder, will result in resource value losses for its ecosystems.

B. THE NEED FOR ACTION

The Service Refuge Manual (4 RM 1.1, Planning) states that the purpose of master planning is to "provide long-range guidance for the management of national wildlife refuges."[7]

The Service has identified a need to improve on existing refuge goals and objectives and address various issues that are affecting all the refuge programs, and their interrelationship with the surrounding jurisdictions. Not considering alternatives to the existing management strategy framework would result in missed opportunities for bettering each of the refuge's contributions to the overall ecological region, their own habitat and wildlife resources, and the National Wildlife Refuge System.

C. THE ISSUES

During the course of the planning effort, a series of formal and informal meetings were held to determine the most important issues relative to the lower Colorado River National Wildlife Refuges and the Area of Ecological Concern. Meetings with other Federal agencies, state agencies, representatives of Native American governments, and members of the public, assisted the Service in identifying most of the natural resource-related issues.[8]

The following is a list of major issues that are treated individually in the Lower Colorado River National Wildlife Refuges Comprehensive Management Plan Draft document. These issues surfaced in the various meetings and discussions mentioned above. The management strategies to be adopted, along with accompanying goals and objectives, will ultimately address these issues in some manner.

---

[6]The ecosystem, according to Eugene Odum in his classic work, *The Fundamentals of Ecology*, is "the largest functional unit in ecology." An ecosystem includes organisms (biotic communities) and inorganic structures such as geological formations, and the weather (abiotic environment). Each of these elements influence the properties of the other. Both elements are "necessary for maintenance of life as we have it on the earth." [Odum, Eugene, *The Fundamentals of Ecology*, (W.B. Saunders Company, Philadelphia: 1954)]

[7]At the writing of this document, the Manual Chapter quoted is under revision. Based upon language in later drafts of the revised chapter on Planning, master planning is synonymous with comprehensive management planning.

[8]The record of correspondence and transcripts of the various meetings are part of the project file and may be accessed upon request to the U.S. Fish and Wildlife Service, Region 2, Refuges and Wildlife, in Albuquerque, New Mexico. Copies are also kept on file at each of the Lower Colorado River National Wildlife Refuges.

The identified management planning issues are:[9]

1. Biological Diversity and Habitat Management
2. Endangered Species Management
3. Fisheries Enhancement and Management
4. Migratory Waterfowl Management
5. Wetlands Protection
6. Water Rights
7. Water Management
8. Revegetation
9. Water Quality and Contaminants
10. Refuge Allowable Use Compatibility
11. Land Status and Jurisdiction
12. Non wildlife Oriented Recreation and Law Enforcement
13. Environmental Education and Public Outreach
14. Refuge Recreation Management
15. Interagency Coordination
16. Relationship to Native American Tribes
17. Staffing, Funding, and Coordination

For NEPA purposes, many of the issues listed above were combined. For instance, issues such as Endangered Species Management and Fisheries Management were considered together, along with the larger issue of biological diversity. Also for NEPA purposes, other concerns not mentioned in the above list are also given consideration.

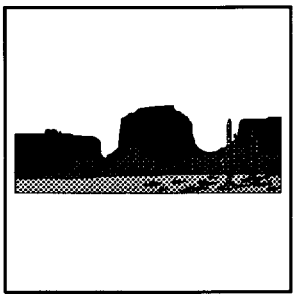
The NEPA issues discussed in this document are:

1. Biological Diversity, Habitat, and Endangered Species
2. Energy Efficiency
3. Ecological Quality
4. Visual Quality
5. Water Management and Quality
6. Native Vegetation
7. Wetlands
8. Compatibility, Refuge Recreation, Harmful Uses, and Law Enforcement
9. Quality of Public Use
10. Interagency Coordination and Native American Cooperation
11. Cultural Resources
12. Socio economics
13. Staffing and Funding

[9]The list of issues are not in any order of priority except to indicate that natural resource issues and goals take precedence by virtue of the ordering of the Goals of the National Wildlife Refuge System. [Refuge Manual 2 RM 1-4]

II. PLANNING DIRECTIONS

The Service must implement policy and manage resources within its jurisdiction in accordance with current legal, administrative, and policy guidelines. This assessment contains a listing of those laws, treaties, and statutes that affect the Service's management of refuge resources, and the official statements of the respective refuge purposes.[10] Also included here is a listing of legal mandates which apply to the BR relative to the lower Colorado River; and those that pertain to the role of the Arizona Game and Fish Department (AGFD). These are included because of the intricate legal and management relationship existing between these agencies, and because these agencies are committed to work as partners.



A. LEGAL MANDATES

Administration of the refuges is ultimately guided by the bills passed by the United States Congress and signed into law by the President of the United States. These statutes are considered to be the law of the land, as are Executive Orders promulgated by the President. The following is a list of most of the pertinent statutes establishing legal parameters and policy direction to the National Wildlife Refuge System. Included are those statutes and mandates that pertain to the management of the River and define the role of the the BR.

Listing of Congressional Acts, Treaties and other Legal Acts that Relate to Administration of the National Wildlife Refuge System

1. Lacey Act of 1900, as amended (16 U.S.C. 701).

2. Antiquities Act of 1906 (16 U.S.C. 431).

3. Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711).
   Migratory Bird Treaty Act of 1978 (40 Stat. 755).

4. Migratory Bird Conservation Act (1929), as amended (16 U.S.C. 715-715s).

5. Migratory Bird Hunting Stamp Act of 1934 (U.S.C 718-718h).

6. Fish and Wildlife Coordination Act (1934), as amended (16 U.S.C. 661-666).

7. Historic Sites Act of 1935 (16 U.S.C. 461).

8. Convention Between the United States of America and the Mexican States for the Protection of Migratory Birds and Game Mammals (1936) (50 Sta. 1311).

9. Convention of Nature Protection and Wildlife Preservation in the Western Hemisphere 1940 (56 Stat. 1354).

10. Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742-742j).

---

[10]The Colorado River National Wildlife Refuges Comprehensive Management Plan contains a full delineation of the more broad agency-wide policy considerations such as the Departmental mission statement, Service "vision for the future" and mission statement, Refuge System goals, and other planning considerations.

11. Refuge Recreation Act, as amended, (Public Law 87-714.76 Sta. 653; 16 U.S.C. 460k 4) September 28, 1962.

12. Refuge Revenue Sharing Act of 1964 (16 U.S.C. 715s), as amended (P.L. 95-469, approved 10-17-78).

13. Wilderness Act of 1964 (16 U.S.C. 1131-1136).

14. Land and Water Conservation Fund Act of 1965, as amended (16 U.S.C. 460L-4 to 460L-11), and as amended through 1987.

15. National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee).

16. National Historic Preservation Act of 1966 (16 U.S.C. 470).

17. National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321-4347).

18. Protection and Enhancement of Environmental Quality Executive Order of 1970 (Executive Order 11514, dated March 5, 1970).

19. Environmental Education Act of 1975 (20 U.S.C. 1531-1536).

20. Use of Off-Road Vehicles on the Public Lands Executive Order of 1972, as amended (Executive Order 11644, dated February 8, 1972, as amended by Executive Order 11989, dated May 24, 1977).

21. Endangered Species Act of 1973 (16 U.S.C. 1531-1543 87 Stat. 884) P.L. 93-205). The Endangered Species Act as amended by Public Law 97-304, The Endangered Species Act Amendments of 1982, dated February 1983.

22. Floodplain Management Executive Order of 1977 (Executive Order 11988, dated May 24, 1977).
23. Wetlands Preservation Executive Order of 1977 (Executive Order 11990, dated May 24, 1977).

24. The Archeological Resource Protection Act of 1979 (P.L. 96-95, 93 Sta. 721, dated October 1979). (16 U.S.C. 470aa - 47011).

25. Fish and Wildlife Conservation Act of 1980 (P.L. 96-366, dated September 29, 1980). ("Nongame Act") (16 U.S.C. 2901-2911; 94 Stat. 1322).

26. Administrative Procedures Act (5 U.S.C. 551-559, 701-706, 1305, 3105, 3344, 4301, 5362, 7521; 60 Stat. 237), as amended (P.L. 79-404, as amended).

27. Bald Eagle Protection Act of 1940 (16 U.S.C. 668-668d; 54 Stat., as amended.

28. Canadian United States Migratory Bird Treaty (Convention Between the United States and Great Britain (for Canada for the Protection of Migratory Birds. (39 Stat. 1702; TS 628), as amended.

29. Clean Air Act (42 U.S.C. 1857-1857f; 69 Stat. 322), as amended.

30. Colorado River Basin Project Act (43 U.S.C. 616aa-, 620, 620a, 620a-1, 620a-2 620c-1, 620d, 620k, 620hh, 1501-1556; 82 Stat. 886).

31. Colorado River Storage Project Act, Section 8 (43 U.S.C. 620-620o, except certain sections classified to the Colorado River Basin Project Act; 70 Stat. 105), as amended.

32. Convention on Wetlands of International Importance Especially as Waterfowl Habitats (I.L.M. 11:963-976, September 1972).

33. Cooperative Research and Training Units Act (16 U.S.C. 753a-753b, 74 Stat. 733), as amended. P.L. 86-686).

34. Federal Aid in Fish Restoration Act (16 U.S.C. 777-777k, 64 Stat. 430).

35. Federal Aid in Wildlife Restoration Act (16 U.S.C. 669-669i; 50 Stat. 917), as amended.

36. Federal Environmental Pesticide Control Act of 1972 (7 U.S.C. 136-136y; 86 Stat. 975), as amended.

37. Federal Land Policy Management Act of 1976 (43 U.S.C. 1701-1771, and other U.S.C. sections; 90 Stat. 2743). Public Law 94-579, October 1976.

38. Federal Power Act (16 U.S.C. 791a 825r; 41 Stat. 1063), as amended.

39. Federal Property and Administrative Services Act of 1949 (40 U.S.C. 471-535, and other U.S.C. sections; 63 Stat. 378), as amended.

40. Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. 1251-1265, 1281-1292, 1311-1328, 1341-1345, 1361-1376, and other U.S.C. titles; 86 Stat. 816), as amended.

41. Federal Water Project Recreation Act (16 U.S.C. 4601-12-4601-21;79 Stat. 213), as amended P.L. 89-72, approved July 1985.

42. Fish and Wildlife Improvement Act of 1978 (16 U.S.C. 7421; 92 Stat. 3110) P.L. 95-616, November 1978.

43. Flood Control Act of 1944 (16 U.S.C. 460d, 825s and various sections of title 33 and 43 U.S.C.; 58 Stat. 887), as amended and supplemented.

44. Freedom of Information Act (5 U.S.C. 552; 88 Stat. 1561.

45. Refuge Trespass Act (18 U.S.C. 41; Stat 686).

46. Rivers and Harbors Act of 1899 (33 U.S.C. 401 et seq.; 30 Stat. 1151, as amended and supplemented.

47. Transfer of Certain Real Property for Wildlife Conservation Purposes Act of May 1948, (16 U.S.C. 667b-667d; 62 Stat. 240), as amended.

48. Water Resources Planning Act (42 U.S.C., 1962-1962a-3; 79 Stat. 244), as amended.

49. Waterfowl Depredations Prevention Act (7 U.S.C. 442-445; 70Stat. 492), as amended.

50. Clean Water Act of 1972, Section 404.

51. The Food Security Act of 1985 (Farm Bill).

Bureau of Reclamation Mandates

1. Colorado River Basin Project Act, Sept. 30, 1968, Public Law 90-537, 82 Stat. 885.

2. Colorado River Basin Salinity Control Act, June 24, 1974, Public Law 93-320, 88 Stat. 266.

3. Reclamation Act of 1902, 32 Stat. 388, 43 U.S.C. 391.

4. Protection of Property Along the Colorado River - June 25, 1910, Pub. Res. 43, 36 Stat. 883.

5. Colorado River Front Work and Levee System Act, March 23, 1925, 43 Stat. 1186, Public Law 585, as amended.

6. Boulder Canyon Project Act, December 21, 1928, 45 Stat. 1057, as amended.

7. Conservation of Wildlife, Fish and Game, March 10, 1934, 48 Stat. 401.

8. Parker-Davis Project, Public Law 373, May 28, 1954, 68 Stat. 143.

9. Coordination of Recreation Programs, Public Law 88-29, May 28, 1963, 77 Stat. 49.

State of Arizona Statutes[11]

The following are pertinent sections of Arizona law which help clarify the role of AGFD in wildlife management activities and the administration and regulation of watercraft on national wildlife refuges.

1. Arizona Revised Statutes, Title 17, Sec. 102

   Section 102 states: "Wildlife, both resident and migratory, native or introduced, found in this state except fish and bullfrogs impounded in private ponds or tanks or wildlife and birds reared or held in captivity under permit from the commission, are property of the state and may be taken at such times, in such places, in such manner and with such devices as provided by law or rule of the commission."

2. Arizona Revised Statutes, Title 17, Sec. 201

   Section 201 states: "The laws of the state relating to wildlife shall be administered by the game and fish department."

3. Arizona Revised Statutes, Title 5, Sec. 302

   Section 302 states: "The provisions of this chapter apply to all watercraft operating on all of the waterways of this state, including that part of waters common to interstate boundaries which is within the boundaries of this state, excluding vessels owned by agencies of the federal government in performance of their official duties."

[11]A list of applicable California statutes was not readily available, however, the relationship between the Service and the Arizona Game and Fish Department only applies to the Arizona side of the refuge lands. A similar relationship exists between the Service and the California Department of Fish and Game.

4. Arizona Revised Statutes, Title 5, Sec. 311 A.7

Section 311 A.7 states: "The commission may administer the law enforcement and boating safety program on the state level, and accept federal grants for the purpose of boating safety and related enforcement."

B. REFUGE PURPOSE STATEMENTS

Refuge Purpose Statements are primary to the management of each refuge within the System. The Purpose Statement is the basis on which primary management activities are determined. Additionally, these statements are the foundation from which "allowed" uses of refuges are determined through a defined "compatibility process."[12]

Havasu NWR Purposes

Havasu NWR was established by Executive Order 8647 on January 22, 1941, ". . . as a refuge and breeding ground for migratory birds and other wildlife."[13]

Bill Williams River NWR Purposes

Bill Williams River NWR was originally established concurrently with establishment of Havasu NWR by Executive Order 8647. Subsequently, a larger portion of the Bill Williams River NWR was acquired from The Nature Conservancy (TNC) in 1977. Taking into account the original establishment, along with Havasu NWR and the 1977 acquisition from TNC, the refuge purpose is defined as a ". . . refuge and breeding ground for migratory birds and other wildlife . . ." (Executive Order 8647), and is suitable ". . . for incidental fish and wildlife oriented recreational developments, the protection of natural resources, and conservation of endangered species or threatened species."[14]

Cibola NWR Purposes

Cibola NWR was established on August 21, 1964, by Public Land Order 3442. It was ". . . reserved for use of the ... United States Fish and Wildlife Service, as the Cibola National Wildlife Refuge" and ". . . subject to their use for reclamation purposes or wildlife refuge purposes."[15]

Imperial NWR Purposes

Imperial NWR was established February 14, 1941, by Executive Order 8685, ". . . as a refuge and breeding ground for migratory birds and other wildlife. . . . The Refuge ". . . is subject to their use for the purposes of the Colorado River Storage Project."[16]

---

[12]Please refer to the Lower Colorado River National Wildlife Refuges CMP for a discussion regarding the revised compatibility policy.

[13]Appendix B, Purposes of National Wildlife Refuges, 1992 Update.: Havasu National Wildlife Refuge.

[14]Refuge Recreation Act, as amended, P.L. 87-714.

[15]Federal Register, August 28, 1964, Title 43, Public Land Order 3442.

[16]Appendix B, Ibid., Imperial NWR.

C. LAND STATUS

Havasu NWR

Havasu NWR currently consists of 38,427 acres. The Service owns most of the land within the defined boundaries of Havasu NWR, as a result of Public Land Orders that overlaid the Refuge on BR-acquired lands. The Refuge adjoins acreage belonging to the Fort Mojave Indian Tribe, the BLM, and the Chemehuevi Indian Tribe.

The Refuge (excluding the Bill Williams River NWR acreage) as established encompassed 41,252 acres and was enlarged to 44,013 acres in 1949.[17] With the founding of Lake Havasu City in 1964, the Refuge was reduced to 20,259 acres under the Lower Colorado River Land Use Plan. In 1968, the Needles Peaks area was added to the Refuge, bringing the total acreage to 39,747. In 1974, 420 acres were deleted and returned to the Chemehuevi Indian Tribe.

In 1991, an extensive land exchange took place between the BLM and the Service, with involvement from the State of Arizona. The exchange allowed the Service to acquire previously leased lands at the Buenos Aires NWR, southwest of Tucson, Arizona. As a result of the transaction, the Havasu NWR relinquished 900 acres. The transaction was part of the Fort McDowell Indian Water Rights Settlement and the Santa Rita exchange. Refuge boundaries were affected on the north and east; much of the acreage to the east of State Highway 95 is now owned by the State of Arizona. As a result of the newest transaction, Havasu NWR now has 38,427 total acres.

One concession exists at Five Mile Landing, which is adjacent to the Topock Marsh. This concession is privately operated under a 20-year lease. This concession provides temporary trailer spaces, camping, tackle, boat rental, docks, and grocery items. The lease terminates on July 31, 2006. During the term of this lease, the area described by the lease is zoned for use as a concession. Uses are those specified in the lease agreement and allow for overnight camping and the parking of campers and trailers meeting the standards as described in the agreement. A total of 74 trailer sites are available, most of which are filled by trailer or mobile homes. Funds collected by the Service for the operation of the concession go directly to the BR. The domestic water use for this concession is lower Colorado River water supplied from Golden Shores Water Conservation District, subject to its Reclamation water delivery contract.

There is one slight encroachment of the Refuge by the Golden Shores Marina operation at the south end of the Topock Marsh Management Unit. It encompasses several hundred square feet where boats have been allowed to moor for the marina. In lieu of a formal lease agreement, this activity has been addressed by "special use permit" over the past several decades.

Bill Williams River NWR

The Bill Williams River NWR is currently comprised of 6,105 acres. The Refuge originally consisted of 1,748 acres in and around the River delta and lake. The land comprising the Bill Williams River NWR is owned by the Service fee simple and by withdrawal from the Public Domain. In October 1977, 1,575 acres were purchased from the Arizona Ranch and Metals Company through TNC as an addition to the Bill Williams River NWR. An additional 2,781 acres of desert upland and wash, located adjacent to and up-slope from the River bottomlands and lake, were withdrawn from the BLM in 1981.

The Service is currently interested in developing a water management strategy involving the existing Bill Williams River NWR and an 8,400-acre area commonly known as the Planet Ranch. The Planet Ranch has been under

[17]The Bill Williams River NWR, formerly the Bill Williams Unit of the Havasu NWR, is part of the original Executive Order.

the ownership of the City of Scottsdale, Arizona. It is hoped the strategies contemplated will lessen the depletion in ground water levels currently occurring from extensive agricultural pumping.

A slight encroachment by the Hillcrest View Mobile Home Park is handled by a Special Use Permit. Easements on the refuge include two power lines, a telephone line, and a county road which is maintained by La Paz County.

Cibola NWR

Land within the Cibola NWR boundary was acquired by both fee simple and through withdrawal from the Public Domain (i.e., BLM lands). The Refuge consists of approximately 16,667 acres. There are 297 acres leased from the State of California for a 49-year period, ending July 31, 2031.

Efforts have been made to add to the existing land in Arizona and California. A limiting factor in California is the lack of water rights and the complicated measures of moving the water to appropriate habitat areas. Areas identified for acquisition have been integrated into the planning process. It should also be noted that a Federal Court order determined that the lands beneath the Old River Channel of the River were not part of the original Federal acquisition of lands for mitigation and that they are currently owned by the States of California and Arizona.

The Cibola NWR Annual Narrative for 1989 indicates that the Continental Telephone Company of California maintains two easements across Refuge land. One is in California and the other is along the eastern boundary of the Refuge in Arizona. Two adjacent farms maintain irrigation easements across Refuge land; the easements were granted by the BR during the acquisition of private land for establishment of the Refuge.

Imperial NWR

The Service owns all land within the defined boundaries of Imperial NWR by withdrawal from the Public Domain. Originally, the Refuge encompassed 46,792 acres. Withdrawals in 1963 of 3,410 acres for Picacho State Park, in 1968 of 17,617 acres by Executive Order 4367, and in 1982 of 640 acres to the BLM reduced the Refuge to 25,765 acres. The Santa Rita land exchange affected a reduction of 640 acres on the southern end of the Refuge, which reduced the total acreage to 25,125 acres.

D. ADJACENT LAND USE

Generally, land uses surrounding the four national wildlife refuges in the Area of Ecological Concern are either owned by Indian tribes or other Federal and state agencies. A majority of the lands belonging to the Federal government are currently managed by either the BLM, the BR, or the Department of Defense.

Along the River's riparian corridor are segments belonging to the States of Arizona and California. Some of these lands are used for state recreation areas. There are few private lands directly adjacent to the lower Colorado River national wildlife refuges. Most of the private holdings are used primarily for agriculture in the Cibola and Palo Verde Valleys.

The Lake Havasu City limits adjoin the southern end of the Topock Gorge Unit of Havasu NWR. Depending on land use and resource planning by the municipality, land use could affect the Refuge. The refuge manager maintains close contact with the policy makers of the city, however, and will have input concerning land use changes in the areas that might affect the Refuge. A similar situation exists with the village of Martinez Lake, Arizona, although on a much smaller scale. The largest single possibility of urban growth directly affecting any of the refuges is the Needles and Lake Havasu City area. Bullhead City, Arizona, and Laughlin, Nevada, are

about 20 miles to the north of the Refuge, and as these two communities grow, economic and environmental pressures will increase on the Refuge.

E. DESIGNATED SITES

Cultural Resources

The archeological sites recorded to date on the four refuges typify the archeology of the lower Colorado River. Rock art sites, ground images known as geoglyphs, rock alignments and clearings, dance patterns, cairns, trails, and sparse scatters of lithic material and pottery shards, are the primary archeological occurrence. Collectively, these sites are found in great number, and it is estimated that at least 2,000 such sites remain unrecorded on the four national wildlife refuges alone. Almost totally lacking, however, are the habitation/village sites and stratified sites resulting from very long term occupation, which would normally be expected in an area with a record of continuous occupation of at least a thousand years. The scarcity of deep sites and village sites is a consequence of indigenous settlement patterns, where seasonally occupied farm village sites were located on the flood plain. Annual flooding and movements of the River resulted in destruction of the evidence of this long term habitation. That which was not destroyed by the floods is deeply buried by river silts, while hundreds more sites were inundated by the Parker and Imperial dams. But for a handful of deep sites and habitation sites, most of what remains are the limited use localities of the uplands and river terraces, as well as the short term wild resource harvest sites located at great distance from the River. The result is a poorly defined chronology for the region, and very limited information on key aspects of prehistoric River culture. Indeed, more than any other region of the southwest, the native tradition of the lower Colorado River is defined almost entirely through modern ethnography and historic accounts, rather than by evidence of prehistoric archeology.

In gross terms, conventional measures of archeological significance do not apply here. The significance of the archeology does not stem from the material richness or depositional complexity of the sites themselves. More relevant in defining the value of the cultural resources on these refuges is the recognition that a cultural continuum exists between the prehistoric and modern Native American presence on the River. Although the millennia-old systems of subsistence and settlement no longer exist, it is important to note that many traditional practices survived quite late into the historic era, and that Native American communities on the River continue to regard refuge lands with a profound reverence for religious and ancestral values.

Archeologists have applied the term "Patayan" to the prehistoric occupation on the River. It refers to the era after about A.D. 700 when pottery and agriculture were introduced to the River bottomland. The Patayan culture is largely defined by the Lower Colorado Buffware ceramic tradition, but information on prehistoric architecture, burial practices, and material culture is limited. The available archeological data points to a number of traits, including flood water farming supplemented by fishing and seasonal gathering, small and widely separated "rancheria" settlements, free standing (non-contiguous) earth lodges, temporary ramada structures, roasting pits and sealed vessels for storage, rock and mud mortar surface structures, timber lined pithouses, paddle-and-anvil pottery, and cremation as the most common mortuary practice. Added to this list are the upland sites listed above for which the region is best known. Among the most spectacular of all archeological phenomena in North America are the ground images called "geoglyphs," sometimes very large figures in geometric, anthropomorphic, zoomorphic, and other symbolic representations that are found chiefly on the River terraces and elevated platforms of desert pavement.

The Patayan archeological tradition is widely believed to be ancestral to the Yuman people of the flood plains who, along with the later arriving Chemeheuvi, have historically lived on the River and whose reservations lie directly above and below the national wildlife refuges today. At the time of the Spanish entry into the region, the principal Yuman-speaking groups living along the River were the Mojave in the north, the Yuma (Quechan) in the lower River, the Cocopah in the delta, and the Maricopa/Halchidhoma on the Gila River and also in the middle valley between the Mojave and the Quechan.

The Shoshonean-speaking Chemehuevi entered the Colorado valley later in historic times. The modern reservations are the Cocopah, Fort Yuma, Colorado River (shared with other, non-Yuman tribes), Chemehuevi, and Fort Mojave. Many residents of these communities continue to regard certain places on the River with a high degree of religious and ancestral significance. Knowledge about these places and their meanings is entirely proprietary. There are locations on the four lower Colorado River refuges, however, with which the tribes maintain a special relationship. Some are still in use and regularly visited by tribal members.

Research Natural Areas

Research Natural Areas (RNA) on national wildlife refuges are part of a national network of reserved areas under various ownerships. This network is the result of a designation system recognized by other Federal land administering agencies and the Federal Committee on Ecological Reserves. They are administratively established by the participating agency. RNAs are intended to represent the full array of North American ecosystems; biological communities, habitats, and phenomena; and geological and hydrological formation and conditions, all intended for research purposes. They are areas where natural processes are allowed to predominate without human intervention. Under certain circumstances, however, deliberate manipulation is used to maintain unique features that the RNA was established to protect.[18]

There is one RNA within the Area of Ecological Concern at the Bill Williams River NWR. In this case, deliberate actions have taken place, such as extensive tree planting, in an effort to enhance and protect the remaining native vegetation along the Bill Williams River riparian area. Because of the Service's lack of control over the release of water from Alamo Dam and the associated watershed, protecting the natural processes has been difficult.

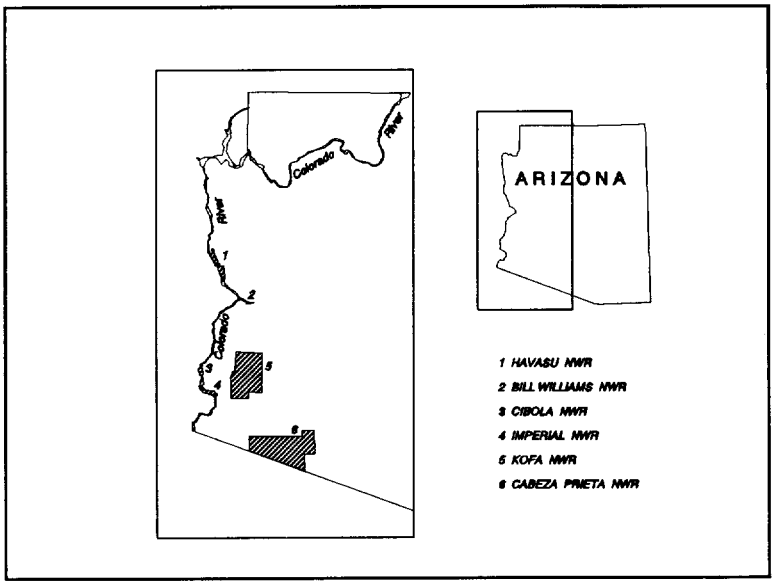


Figure 2 Wilderness areas were designated in Arizona at Havasu, Imperial, Kofa, and Cabeza NWRs.

Wilderness

There are a total of 75 designated wilderness areas (units), comprising nearly 20.7 million acres, on lands controlled by the Service. This includes 74 areas on national wildlife refuges and one area on a national fish hatchery.

Passage of the Arizona Refuge Wilderness Act, P.L. 101-628, November 28, 1990, added more than 1.3 million acres of national wildlife refuge lands to the wilderness system. Both Havasu and Imperial NWRs were affected by this recent congressional designation. A total of 14,606 acres from Havasu NWR and 9,220 from Imperial NWR were added. All of the designated lands in both refuges are primarily upland desert lands. All of the designated lands in borth refuges are primarily upland desert lands. Proposals are now being considered to add an additional 5,836 acres on the California side of the Imperial NWR and 3,195 acres on the California side of Havasu NWR as part of the California Desert Protection Act. As noted earlier, this is expected to contribute significantly to the protection already afforded remote and roadless areas integral to the desert upland habitat resources in each of the refuges.

[18]Refuge Manual 8 RM 10.

III. AFFECTED ENVIRONMENT: RESOURCE INVENTORY

A. AREA OF ECOLOGICAL CONCERN SOCIOECONOMIC FEATURES

In the past, the economics of the River region were dominated by mining and agriculture, and social attitudes were highly influenced by developments and decisions related to these industries. Recently, the lower Colorado River Valley has "come of age" as a recreation mecca. The discovery of the River by tourists and recreationers, primarily from the metropolitan centers of Southern California and Phoenix, Arizona, is amply documented in the pyramiding use occurring along the entire River, from Lake Mead to the International Boundary. Improved highways, increased leisure time, the advent of the pickup camper, and the general increase in affluence of society have all contributed to the boom. Gold rushes have been replaced by "holiday rushes." With them have come a change in economics and, though more slowly, a change in the social attitudes of the local citizenry. Recreational use of various lakes and areas along the River has grown in a rapid, though haphazard, manner,[19] and projections indicate continued growth. There is little doubt that outdoor- and water- oriented recreation will continue to predominate the area in future years.

If visitor use from all the lower Colorado River refuges were combined, it can be shown that the majority come to the area to enjoy water-oriented activities. This is more true for Havasu and Imperial NWRs and less true for Cibola and Bill Williams River NWRs. People have also discovered the River as a place to live, at least for part of the year. Thousands of people, especially retirees, spend the winter along the River and adjacent areas. Virtually all communities along the River are experiencing rapid growth.

Population Growth -- Between the years 1980 and 1990, Yuma, La Paz, and Mohave counties in Arizona grew an average of 21 percent, and growth for the three counties between 1990 and 2000 is expected to surpass an average of 20 percent. Populations in Yuma County alone are expected to surpass 150,000 by the year 2000. The largest community at the southern end of the River, Yuma had a 1990 resident population of 50,000. With an influx of visitors, the wintertime population is approximately 95,000.[20]

Lake Havasu City, located in Mohave County between Havasu and the Bill Williams River NWRs, is one of the fastest growing communities along the River. Prior to 1964, only uninhabited desert prevailed. Mohave County's growth from a countywide population of 25,857 in 1970 to a 1990 population of more than 100,000, is due in large part to the rapid growth of Lake Havasu City. There have also been significant increases in populations in the Bullhead City area because of its proximity to the new gambling resort community of Laughlin, Nevada, located across the River. Projected population estimates for the next 20 years for Mohave Valley, Riviera, Bullhead City, Arizona, and Laughlin, Nevada, areas (9 to 22 miles north of Needles, California) are for 200,000.

Projected growth for the Cibola Valley (near Cibola NWR) in Arizona and the Palo Verde Valley in California is slight by comparison. However, the valleys are equi-distant from the metropolitan areas of Los Angeles to the west and Phoenix to the east along Interstate 10. The major community on the California side of the River is Blythe, with a population of 10,000. The population of both valleys is approximately 25,000.

Income Trends -- The 1984 per capita income for Mohave, LaPaz, and Yuma Counties averaged a little more than $10,000 per year. Since then, there have been no significant changes in the employment bases for these counties. This average is well below the 1985 Arizona statewide per capita figure for 1985 of almost $30,000 per year. The employment base for this area has been primarily government employment and agriculture. Mining activities have dwindled to a point where that industry is negligible. Lower Colorado River recreation

---

[19] For a description of modern day social and economic demands stressing the Colorado River, please refer to an article in the June 1991 issue of *National Geographic* entitled "The Colorado -- A River Drained Dry" by Jim Carrier.

[20] Arizona Statewide Comprehensive Recreation Plan, 1989, pg. 28.

opportunities, however, are projected to shift the income base to a service- oriented economy to meet the needs of recreational users and a growing number of the retired community relocating to communities situated along the River.

Economic Development Pressures -- The five basic economic development pressures on the natural resources along the River are: agricultural, hydroelectric, residential, recreational, gambling.

The hydroelectric demands of the southern California metropolitan areas and the agricultural demands of both California and Arizona have been the fundamental forces driving Colorado River water storage and release policies since the construction of Hoover Dam in the 1930's. These demands are both ever present and ever growing as the BR manages the River to meet the interests of all affected entities.

Likewise, residential and recreational demands, such as sport fishing and watercraft sporting, place additional pressures on the BR to manage water in ways that will satisfy the respective needs. It is the increasing demand for recreational opportunities along the River that is influencing and calling for the private development of public lands. Private land developers are becoming increasingly attuned to the recreation- and outdoor-oriented lifestyles desired by newcomers to the arid southwest, and they are using this theme in their marketing materials. Developers are making more serious attempts to obtain private development rights within or directly bordering prime natural environments.

Lands with existing water features are experiencing particularly intense development pressures. Studies of the effects of a water feature on property values also help to explain private developer interest. Analysis by the Department of the Interior found the estimated value per acre of recreational land having direct access to water was about $1,370 nationally in 1965. At the same time, the value of recreational lands without access to water was only $530.[21] The Arizona SCORP states: "An unforeseen side effect of increasingly severe groundwater use restrictions (in Southwestern States) has been a shift of development pressure towards areas containing existing water features. Thus, we are seeing tremendous development pressure along the Colorado River, as one example."[22]

One of the fastest growing pressures on the natural resources in the Area of Ecological Concern are those caused by the growing desire to increase gambling as a source of income at Laughlin, Nevada, and on Native American tribal lands. The Fort Mojave Indians have expressed a desire to implement gambling on their reservation in order to draw tourists and outside dollars to the economy. Laughlin is already established as a gambling center alternative to Las Vegas, which lies about 100 miles to the north. This desire to implement gambling as a means to improve economic development and standards of living in the area also has costs associated with it, including the creation of human waste, air pollution, and other environmental contamination challenges. It should also be mentioned that population growth in Mohave County, Arizona, and Clark County, Nevada, is generating additional pressures on the environment especially related to air pollution, water pollution, and solid waste disposal. This is causing great concerns by down-river jurisdictions. Native American tribes have expressed their desire to see better water quality monitoring techniques employed throughout the River because of potential hazardous and toxic waste problems caused by ever-increasing populations.

---

[21]U.S. Department of the Interior, Study Committee, "Recreational Land Price Escalation,", from Arizona SCORP, page 156.

[22]Chapter 5 of the Arizona Statewide Comprehensive Recreational Plan, (SCORP) "Trends Influencing Outdoor Recreation" and which pertain to recreational use trends of water resources, pages 119 through 220 are hereby incorporated by reference.

B. NATURAL RESOURCE FEATURES AND CORE HABITAT IDENTIFICATION[23]

From a biological perspective, the Area of Ecological Concern is made up of several ecosystems comprised of a variety of desert and riparian biomes and habitat types, each in varying states of ecological health.[24] The degree of ecosystem health and naturalness is somewhat dependent on the habitats' relationship with the larger environmental influences.[25] The Colorado River, with its varying water levels and flows, is perhaps the single most influential of the environmental factors. This Area of Ecological Concern, with its delicate mosaic of desert and riparian ecosystems, has been characterized as a "thin green line" surrounded by a world in which drought is the rule rather than the exception.[26] Overlaid on this fragile set of interlocking pieces of the biological panorama are the artificial boundaries defined by politics, economics, and sociology.

Much of the land surrounding the thin green line is under the jurisdictional control of governmental agencies with natural resource-oriented directives. Chief among these agencies are the Service, BLM, the BR, Arizona State Parks Department, Arizona Game and Fish Department, and the California Department of Fish and Game. Also of great importance are the large land areas under the control of various Native American tribes who have had a long history of recognizing the value of protecting natural resources.

Early on in the planning effort, a series of habitats along the riparian area were identified as being "core elements" of the Area of Ecological Concern. These delineations were made regardless of current management and jurisdiction and were based on wildlife qualities, vegetation structure, condition, and relative potential for rehabilitation. These key land and water elements of the ecological mosaic were called "Core Habitats." Understood collectively, Core Habitats, including the refuges, provide the basis for the habitat enhancement and protection for the entire Area of Ecological Concern. Identification of these habitats is the first step toward understanding how the lower Colorado River national wildlife refuges fit within the ecological mosaic described below.

---

[23]A Core Habitat can be defined as habitats that: (1) Carry or potentially carry a naturally diverse wildlife mix by virtue of the structure and health of the vegetation communities which thrive there, and the availability of resources to maintain and enhance these communities; (2) without which the remainder of the ecosystem(s) is considerably diminished; and, (3) closely represent in character the quintessence of the Area of Ecological Concern as it existed prior to modern technological influences upon the natural landscape. (i.e. natural mixes of vegetation and wildlife as would be provided by natural cycles of succession and predation). One of the purest examples of a core habitat is the Bill Williams River NWR/ Planet Ranch area. (See Map).

[24]Reference Lower Colorado River Vegetation Management Study, Phase I, U.S. Bureau of Reclamation, June 1990, pg. 8 for a list of Vegetation Communities and Criteria Used in classification (Younker and Anderson 1986).

[25]According to Odum, "The concept of the ecosystem is and should be a broad one, its main function in ecological thought being to emphasize obligatory relationships, interdependence, and causal relationships." [Odum, Eugene, *The Fundamentals of Ecology* (W.B. Saunders Company, Philadelphia: 1954)]

[26]*The Thin Green Line* by Aubrey Stephen Johnson treats desert riparian ecosystems, especially in Arizona and New Mexico, as the premier biological resource in the entire arid Southwest. This article is printed in "Preserving Communities & Corridors" (Defenders of Wildlife, Washington, D.C.: 1989).

Natural History[27] -- The Colorado River originates in the Rocky Mountains in Colorado and extends approximately 1,700 miles before emptying into the Gulf of California[28]. The Colorado and its major tributaries travel through the states of Colorado, Wyoming, New Mexico, Utah, Nevada, Arizona, and California. Probably the River's most famous feature is the Grand Canyon. The River, located below the Grand Canyon, flows through a level and rather broad valley; historically, this valley consisted of many alluvial silt beds, marshes, and riparian forests.

Geology

According to geomorphologists, the River and its gigantic canyon has existed only since the Miocene Age. The Colorado, like the Nile, is an exceptional example insofar as contrasts are concerned. Most desert regions are of internal drainage. Not so with the Colorado, for here is a stream flowing through a region of high aridity that has its origins in tributaries beginning at 10,000 feet or more in the Rockies, and terminating at base level in the Gulf of California. It is one of the unique River systems of the world that originates beyond the desert region through which it flows.

The River bisects all of the refuge stations, with the exception of Bill Williams River NWR, and forms an important alluvial feature of an external drainage system. The physiographic features of the area were influenced primarily by the Tertiary period to recent times, with a great number of features being of the Quaternary. The area has many predominant features of early, undivided Pre-Cambrian granitic rocks, especially in the Chemehuevi Mountain region. There is evidence of mineral deposition having occurred on the Arizona side of the River, while much of the Needles Peaks area shows granites of highly weathered varieties.

Natural events shaped the lower Colorado River floodplain, and these events need to be examined in order to understand the type of vegetation that existed along the River. According to Ohmart and Anderson, two factors affected floodplain formation.[29] First, the River carried a large sediment load that contributed to the erosive action of the current. The current eroded the River bank along the outside of each meander, and new soils were deposited on the inside bank. The creation of a stream bank was continual; so was the stream bank's destruction.

Secondly, fluctuating water levels of the River affected the floodplain formation. Between mid-May and the first of July, flood levels reached their peak. The size of the yearly snowpack in the Rocky Mountains and the rapidity of the spring snow melt largely determined the flooding.

Monthly Colorado River flows ranged from 2,000 to 100,000 cubic feet per second, and changing bank formation, along with the variation in flood stages from year to year, created terraced bottoms along the River. Annual inundation replenished and sometimes leveled the lowermost terrace; inundation on the higher terraces was more intermittent, allowing a slower building-destruction cycle.

---

[27] The primary research and description of the natural events which shaped the lower Colorado River ecosystem was done by Bertin W. Anderson and Robert D. Ohmart, Arizona State University, Center for Environmental Studies, acting as consultants to the Bureau of Reclamation. A large body of secondary research has been undertaken by others using the Ohmart-Anderson data. A monograph detailing the history of vegetation, wildlife and man's interactions on the lower Colorado River entitled, *Birds of the Lower Colorado River Valley* by Kenneth V. Rosenberg, Robert Ohmart, Bertin Anderson, and William Hunter, (University of Arizona Press, 1991) contains a more detailed version of the natural history of the lower Colorado River.

[28] The headwaters of the Colorado River begin in central Colorado; however, the headwaters of the Green River, the dominant tributary, begin in Wyoming and flow into the Colorado River north of Glen Canyon Dam in Southeastern Utah.

[29] Ohmart, R.D., B.W. Anderson, and W.C. Hunter. 1988. *The Ecology of the lower Colorado River from Davis Dam to the Mexico-United States International Boundary: a community profile.* Final Report for the U.S. Fish and Wildlife Service. Biological Report No. 85 (7.19). 296 pp.

Soil Resources

The soils within the national wildlife refuges and the Area of Ecological Concern can be separated into three broad categories.

Soil Group #1. The soils in this association are well drained, moderately coarse textured, and shallow to weathered granite or closely related rock. They are formed on moderately steep and steep hills and mountains in this desert area. The surface is gravelly, cobbly, stony, or rocky. The dominant soil is formed on granite or closely related rocks. Small areas of shallow and moderately deep soils with a clay subsoil are in some of the more level areas. Moderately coarse and coarse-textured recent alluvial soils are in the drainage ways. Rock outcroppings are common throughout and are dominant in some areas, especially on Havasu and Imperial NWRs.

Soil Group #2. These are well drained, shallow and very shallow, gravelly, cobbly, stony, or rocky, loamy soils. They are formed on moderately steep and steep basalt, andesite, or rhyolite hills and mountains. The dominant soil is very shallow loamy soil that is gravelly, cobbly, stony or rocky. Basalt rock outcrops and rockland areas are common throughout. Included are small bodies of a shallow clayey soil that occurs on the less steeply sloping areas. Also included are narrow bodies of moderately fine textured recent alluvial soils in the drainage ways.

Soil Group #3. These are deep, gravelly, sandy loam, and moderately deep loamy soils formed on alluvial materials from mixed sources. The surface is gravelly. These soils are on alluvial fans and flood plains with slopes that range from nearly level to strongly sloping. The dominant soils are deep gravelly, sandy loams and may or may not be calcareous. These soils are on nearly level flood plains or gently to strongly sloping alluvial fans. Some of the soils on the fans may have zones of lime accumulation. Another major component of the association is a gravelly loam soil that is moderately deep over gravel. This soil is on gently sloping areas on the fan tops. Many of these soils have a vesicular crust on the surface which inhibits water penetration. Included are coarse textured soil in the drainage ways.

For crop production, soil amendments must be added and extreme care taken to prevent soil loss from wind erosion. Soils surrounding the Cibola NWR have been intensively farmed over the past several decades and have the necessary soil amendments necessary to make the Cibola and Palo Verde Valleys some of the nation's most productive agricultural areas.

Vegetation

Few plants are uniquely adapted to the floodplain of seasonally fluctuating streams, and those that are adapted exist where their roots are in the capillary fringe of the water table. The plant roots then extend only as far from the channel as the stream exerts its influence through the water table. More often then not, the floodplain of the River gets its visual definition from this strip of vegetation. Historically, belts of vegetation have existed along the River. Cottonwood and willow were the dominant riparian forest species, and they occurred primarily on the "first bottom" terrace and on the braided channels. As an adaptation to a frequently flooded environment, these plants were fast growing and relatively short-lived. Once the River was "controlled," there was little or no regeneration; thereby leaving existing native vegetation to the demise of wildfire and non-plant succession. The shrub arrowweed often formed dense monotypical belts along the drier sites adjacent to the willow and cottonwood stands. Screwbean mesquite grew in association with willows where the floodplain of the first bottom escaped inundation for a number of years.

On the second bottom a very different type of riparian vegetation occurred than that which existed next to the River. Honey mesquite was the dominant species in the second bottom. This tree formed relatively sparse monotypical woodlands. Several shrubs grew locally in dense clumps on the second terrace in addition to the

Table II Vegetative Communities and Criteria Used in Classification in 1986 Mapping of Lower Colorado River (AAA Engineering, Inc.) Based On Ohmart-Anderson Data.

Vegetative Communities and Criteria
Used in Classification
Lower Colorado River, 1986

COMMUNITY and CRITERIA

Cottonwood-Willow (CW) *Populus fremontii* and *Salix gooddingii* (the latter in extremely low densities) constituting 10 percent of total trees.

Salt cedar (SC) *Tamarix chinensis* making up 80-100 percent of tree mix.

Salt cedar-Honey Mesquite (SH) *Prosopis glandulosa* making up 10 percent of total trees; rarely found to make up greater than 40 percent of mix.

Salt cedar-Screwbean mesquite (SM) *Prosopis pubescens* making up at least 20 percent of the total mix.

Honey mesquite (HM) *Prosopis glandulosa* making up 90-100 percent of mix.

Arrowweed (AW) *Tessaria sericea* making up 90-100 percent of total vegetation mix.

Atriplex (Quailbush) *Atriplex lentiformis*, *A. canescens* and/or *A. polycarpa* making up 90-100 percent of mix.

honey mesquite. Salt bush was the most prevalent. Where the first and second bottoms abutted, quailbush occurred locally as a narrow belt. In areas of denser, saline, or alkaline soils, inkweed or pickleweed was found.[30]

Impacts of River Control and Development--The demise, and possibly the eventual disappearance, of the cottonwood and willow forests along the River was dictated by two major events.[31] First, by 1936 Hoover Dam essentially stopped all threats of floods, except when heavy runoff from local rains brought water from larger tributaries, such as the Bill Williams River. With the cessation of flood threats, farming of the rich alluvial soils increased and new seedbeds were no longer formed. Consequently, the life cycle of the cottonwoods and willows was irreversibly changed. The damming that followed inundated thousands of acres of riparian habitat.

Around 1920, the second major event took place. An exotic woody species, salt cedar, spread into the lower Colorado River Valley from the Gila River. Salt cedar found optimal ecological conditions as it spread and

[30] Please refer to Table II in this Section.

[31] Ibid. Ohmart et al., 1988.

eventually dominated the floodplain. Mearns that in 1894 there were 400,000 to 450,000 acres of native riparian vegetation in the River floodplain.[32] In 1986, total native riparian vegetation was about 100,000 acres.[33]

According to BR studies, ". . . roughly 40 percent of the remaining area in 1986 was covered in pure salt cedar stands, an additional 43 percent consisted of native plants mixed with salt cedar, and only .7 percent could be considered mature cottonwood or willow habitats."[34]

Initially, salt cedar became established in areas where native vegetation had been cleared and the land left fallow.[35] Salt cedar has a high rate of seed production; the plant produces as many as 600,000 seeds per plant from April through October. The long period of seed production allows salt cedar to germinate well into fall, which is when most native trees are no longer producing viable seeds. These factors, along with river channelization and river-flow management (designed to meet agricultural and hydroelectric needs), have resulted in very little native plant regeneration. Soil and water salinity levels have risen as irrigation practices in the Colorado River Basin have increased. With the exception of salt and quail bush, native plants exhibit a low tolerance to saline soils, while salt cedar thrives under highly saline conditions.

Salt cedar is deciduous and, without floods, large amounts of leaf litter accumulate. Therefore, the possibility of a stand igniting increases, especially during the dry summer months. After such fires, salt cedar and arrowweed quickly regenerate, while cottonwoods and quail bush usually fail to return. In stands of mixed vegetation, salt cedar will be the first to regenerate and, through successive fires, eventually displaces most native species.

As salt cedar displaced native riparian vegetation, wildlife experienced a changed habitat, which required adaptation or relocation. Salt cedar is dense, produces little useful food for wildlife, and harbors few insects. Most wildlife found the new habitat to be less than optimal, and many species have been adversely impacted by the change.

Refuge Wildlife Resources

Havasu NWR Wildlife -- The Colorado River and Topock Marsh, lying adjacent to the desert, account for an interesting array of wildlife. Over 300 species of birds, 42 species of mammals, and 38 species of reptiles have been recorded at Havasu NWR, including the following:

Endangered Species -- Federally-listed endangered species associated with Havasu NWR include the Yuma clapper rail, bald eagle, peregrine falcon, two Colorado River native fishes-- the razorback sucker, and the bonytail chub. Although present historically, the Colorado squawfish has been extirpated from the lower Colorado River. The endangered Mojave desert tortoise may be present on the Refuge. Occasionally, California brown pelicans are seen in the area. The Refuge is also within the range of the lowland leopard frog, federally listed as a candidate species.

---

[32]Mearns, E.A., 1907. *Mammals of the Mexican Boundary of the United States.* A descriptive catalogue of the species of mammals occurring in that region; with a general summary of the natural history, and a list of trees. U.S. National Museum Bulletin. No. 56. 530 pp.

[33]Anderson, B.W., R.D. Ohmart. 1984. *Vegetation Management Study for the Enhancement of Wildlife Along the Lower Colorado River.* Final Report. U.S. Bureau of Reclamation, Lower Colorado River Region, Boulder City, NV. 529 pp.

[34]U.S. Bureau of Reclamation, *Lower Colorado River Vegetation Management Study,* Phase I, 1992.

[35]Ohmart, R.D., W.O. Deason, and C. Burke. 1977. *A Riparian Case History: The Colorado River.* Pages 35-47 in R.R. Johnson and D.A. Jones. Importance, preservation and management of riparian habitat: a symnposium, Tucson, Arizona., U.S. Forest Service General Technical Report RM-43. 217 pp.

State-Listed Species -- The California black rail is listed by California as threatened and by Arizona as endangered. It is also a Federal candidate species. The Southwestern willow flycatcher is listed endangered in California and Arizona, and is proposed for federal listing. In cooperation with the State of Arizona, surveys of appropriate habitat to determine locations of breeding pairs of willow flycatchers were conducted on the Refuge in 1993. No birds were detected at that time. The Arizona Bell's vireo occurs on the Refuge and is listed by California as endangered. Snowy egrets are listed in Arizona as threatened and great egrets have endangered status in Arizona. Both of these egrets are abundant on the Refuge. Once common along the River in large stands of cottonwood and willow, the yellow-billed cuckoo is now listed as endangered in California and threatened in Arizona. It is doubtful that enough habitat exists currently on the Refuge to support a population of yellow-billed cuckoos, but habitat restoration projects should improve the situation for this species.

Waterfowl -- Havasu NWR supports snow geese, Canada geese, mallard, gadwall, northern pintail, green-winged teal, cinnamon teal, American wigeon, northern shoveler, redhead, ring-necked duck, lesser scaup, bufflehead, and the ruddy duck.

Marsh, Water, and Wading Birds -- Yuma clapper rail, California black rail, Clark's grebe, western grebe, double-crested cormorants, least bittern, American bittern, great egret, snowy egret, herons, and common loons utilize the Refuge wetlands.

Shorebirds (Gulls, Terns, and Allied Species) -- Species of this group found on the Refuge include American avocet, black-necked stilt, dowitchers, sandpipers, yellowlegs, willet, long-billed curlew, godwits, ring-billed gulls, black tern, Forster's tern, and Caspian tern.

Raptors -- In addition to the bald eagle and peregrine falcon, red-tailed hawks, great-horned owls, and northern harriers are common. Others sighted on the Refuge have been osprey, kestrel, golden eagle, prairie falcon, barn owl, short-eared owl, Cooper's hawk, and sharp-shinned hawk.

Other Migrant, Resident, and Wintering Avian Species -- Blue grosbeak, common yellowthroat, yellow-breasted chat, black phoebe, phainopepla, western kingbird, and marsh wren are common breeding birds on the Refuge. Phainopepla are present year-round and ruby-crowned kinglets are abundant in winter. Many others species either breed here, migrate through or use the Refuge during winter. Athel tamarisk galleries support breeding Lucy's warblers and summer tanagers. Gambel's quail are abundant throughout the Refuge. White-winged and mourning dove populations are particularly common in the Pintail Slough Management Subunit.

Mammals -- The most notable mammals in this area are the bighorn sheep populations. Other mammals include mule deer, mountain lion, cottontail rabbit, and black-tailed jackrabbit.

Fish -- Surveys of Topock Marsh and Topock Gorge indicate that largemouth bass and black crappie have had good reproductive success in recent years. Although native Colorado River squawfish have been extirpated from the lower Colorado River, this was part of their historic range. Bonytail chub and razorback suckers are still present in small numbers, and re-introductions of these fish to the lower Colorado River are being coordinated by the Parker Fisheries Resource Office.

Reptiles and Amphibians -- Two state (Arizona) species of concern on the Refuge are the lowland leopard frog, which is at the edge of its range on the lower Colorado River, and the Sonoran desert tortoise. Spiny soft shelled turtle, desert iguana, desert collared lizard, western whiptail, chuckwalla, and coachwhip are other species present. Four species of rattlesnakes: western diamondback, speckled, Mohave, and the sidewinder can also be found on the Refuge.

Bill Williams River NWR Wildlife -- The presence of water, and the large amount of wetland and riparian habitats make the Bill Williams River NWR an oasis within the surrounding desert environment. The Bill Williams River NWR wildlife inventory includes:

Endangered Species -- Federally listed endangered bird species associated with the Bill Williams River NWR include the bald eagle, Yuma clapper rail, peregrine falcon, and California brown pelican. Surveys for Yuma clapper rails are conducted annually. At least 15 birds were present in 1993. Populations of perigrine falcons elsewhere are now increasing following a nationwide decline in the early 1950s, and this species should begin nesting again on the cliffs along the lower Colorado River in the future as well. Bald eagles have nested at Alamo Lake since 1987 and an immature was seen on the Refuge in the spring of 1993. Brown pelicans frequently show up in the area in the late summer and early fall and are usually immatures. The black rail is a Federal candidate species and has been recorded in the Bill Williams Delta, as have western least bitterns, a Federal candidate species. The southwestern subspecies of the willow flycatcher is proposed for Federal listing and has been sighted on the Refuge during migration.

There are still small, remnant populations of bonytail chub and razorback suckers in Lake Havasu. In February of 1993, 853 approximately 12" razorback suckers were released into the Bill Williams delta and there are plans to introduce more in the future. The fish are not released into the lake until they grow to a length which excludes them from predation by game fish. Netted off growout areas will be located in coves in Lake Havasu and the delta. There is currently one cove on the island in Lake Havasu City which has razorback suckers and the cove just to the north of the Refuge headquarters will soon be a grow-out area. Although the delta area is in the historical range of the Colorado squawfish, this species has been extirpated from the lower Colorado River.

State-Listed Species -- The California black rail is listed by California as threatened and by Arizona as endangered. The Southwestern willow flycatcher is listed endangered in California and Arizona. The Arizona Bell's vireo is listed by California as endangered and it was one of the most abundant birds to breed on the Refuge in 1993. Snowy egrets are listed in Arizona as threatened and great egrets have endangered status in Arizona. Both of these egrets are found on the Refuge. Once common along the river in large stands of cottonwood and willow, the yellow-billed cuckoo is now listed as endangered in California and threatened in Arizona. A 1989 survey indicated that more than 70 percent of the remaining population in the lower Colorado River Valley is found on the Bill Williams River NWR.

Waterfowl Species -- Canada geese in the area typically feed and loaf in the Planet Ranch, where the City of Scottsdale currently farms 2,300 acres of alfalfa. Most of these geese fly to the Bill Williams River Delta to roost for the night. Migrating flocks of mallards, gadwalls, northern pintails, green-winged teal, cinnamon/blue-winged teal, American widgeons, and northern shovelers, are seen sporadically in the Delta and occasionally further up the river. Other ducks such as redheads, ring-necked ducks, lesser scaup, buffleheads, common goldeneye, ruddys, and common mergansers, frequent the Bill Williams River in greater numbers and are seen in the deeper parts of the Delta, Lake Havasu and below Parker Dam.

Marsh and Waterbirds -- This variety of birds includes common loon, Clark's grebe, western grebe, pied-billed grebe, double crested cormorants, white pelicans, Yuma clapper rail, black rail, black-crowned night heron, Virginia and Sora rail, black-crowned night heron, green-backed heron, great egret, snowy egret, white-faced ibis, common moorhen, and both the least and American bitterns.

Shorebirds (Gulls, Terns, and Allied Species) -- Species common to the area include ring-billed gull, Forster's, caspian and black terns, common snipe, killdeer, spotted sandpiper, long billed curlews, willets, American avocets, marbled godwit, lesser yellowlegs, dunlin, and western sandpiper.

Raptors -- In addition to the bald eagle and peregrine falcon, the Bill Williams/Planet Ranch basin is utilized by red-tailed, Cooper's, and sharp-shinned hawks, turkey vultures, great-horned, western screech, elf, and barn owls.

Other Migrants, Resident, and Wintering Avian Species -- Blue grosbeak, common yellowthroat, yellow-breasted chat, black phoebe, phainopepla, western kingbird, marsh wren, summer tanager, Lucy's warbler, yellow warbler, song sparrow, ash-throated flycatcher, brown-crested flycatcher and black-throated sparrow are known to breed on the Refuge. Many others species, such as northern (gilded) flicker, Gila and ladder-backed woodpecker, Townsend's and black-throated gray warbler, ruby-crowned kinglet, canyon, cactus, and rock wrens, and black-tailed gnatcatchers either breed here, migrate through or use the Refuge during winter. In 1989, an estimated 2,000 pairs of mourning doves and 250 pairs of white-wing doves were present during the nesting season, with an estimated 100 mourning doves over-wintering in the area, primarily at the Planet Ranch. Gambel's quail are very common on the Refuge and are found in uplands as well as riparian vegetation. A few Inca doves also occur throughout the year.

Mammals -- The most notable of the mammals in this area are beaver, mule deer, javelina, bighorn sheep, coyote, mountain lion, bobcat, black-tailed jackrabbit, cottontail rabbit, and raccoon. Several species of bats and rodents species occur on the Refuge also, and many of them have Federal categories 1 and 2 listing status.

Fish -- Surveys in the past of the rivers and creeks above Alamo Lake (Santa Maria, Little Sandy and Burro Creek) determined that several native fish species were present. It is safe to assume that these fish occured historically in the lower reaches of the Bill Williams River as well. These include the speckled dace, desert sucker, flannelmouth sucker, longfin dace and Gila sucker. The roundtail chub, longfin dace and desert sucker have recently been reintroduced onto the Refuge with the hope that populations of them will become established.

Amphibians and Reptiles -- Typical of deserts, this is a numerous and diverse group of organisms. The presence of wetland areas provides a more varied habitat which increases the species list even more. The lowland leopard frog (listed as a Federal candidate species) is on the edge of its range in the lower Colorado River valley. The Refuge is within the range of the Sonoran desert tortoise, spiny soft shelled turtle, desert iguana, desert collared lizard, western whiptail, chuckwalla, and coachwhip. Four species of rattlesnakes, western diamondback, speckled and Mohave rattlesnakes, and the sidewinder can also be found on the Refuge.

Cibola NWR Wildlife -- Cibola NWR continues to play a central role in efforts to enhance and protect native resident, migratory, and wintering avian species. Surveys for resident and migratory avian species have been conducted for the past three years on the Refuge, and the area is famous for its abundant winter waterfowl and sandhill crane populations. Until very recently, yellow-billed cuckoos and summer tanagers frequented and bred in small cottonwood-willow stands on the Refuge. Nevertheless, a variety of amphibian, reptilian, avian, and mammalian species still thrive on the Refuge. The Cibola NWR wildlife inventory includes the following.

Endangered Species -- Six Federally listed endangered species are associated with the Cibola NWR: Brown pelican, bald eagle, Yuma clapper rail, peregrine falcon, and the Colorado River native fishes which include the razorback sucker and the bonytail chub. The Colorado squawfish has been extirpated from the lower Colorado River, but the Refuge is in its historical range.

State-Listed Avian Species -- A number of state listed species are also found on the Refuge. The California black rail and the Southwestern willow flycatcher are listed by both the AGFD and the CDFG as endangered, and both are present in the Cibola and Palo Verde Valleys. The yellow-billed cuckoo is listed as endangered by the State of California and threatened by the State of Arizona. Until recently, this species was sighted frequently on Cibola NWR. Leading lower Colorado River riparian habitat authorities have used the attractability of this species as a gauge for revegetation success or failure. The Arizona Bell's vireo is listed by

California as endangered. Snowy egrets are listed in Arizona as threatened and great egrets have endangered status in Arizona. Both of these egrets are common on the Refuge.

Waterfowl Species -- Since its establishment, Cibola NWR has become an important wintering area for Canada geese, northern pintail, mallard, American wigeon, green-winged teal, and gadwall. It should be noted that the Canada goose population peaks in December and January, which accounts for most of the Refuge's public use days during that time period. For example, the 1989 Annual Narrative indicates that in January of 1989, the population peaked at 24,500 and accounted for approximately 1,600,000 public use days.

Marsh, Water, and Wading Birds -- Cibola NWR supports a variety of marsh and waterbirds throughout the calendar year. The most abundant species occurred within the Old River Channel. This category includes: greater sandhill crane, white pelican, double crested cormorants, California black rail, Virginia rail, and Yuma clapper rail.

Shorebirds (Gulls, Terns, and Allied Species) -- Numerous shorebirds use the plowed agriculture fields, marsh, sandbars and, shoreline during migration. These include black-necked stilt, American avocet, willet, killdeer, long-billed dowitcher, western and least sandpipers.

Raptors -- In addition to the bald eagle, the following raptors are part of the Cibola NWR wildlife inventory: osprey, northern harrier, Cooper's hawk, sharp-shinned hawk, Harris' hawk, red-tailed hawk, American kestrel, elf owl, western screech-owl, turkey vulture, and western burrowing owls.

Other Migrants, Resident, and Wintering Avian Species -- The Southwestern willow flycatcher and the yellow-billed cuckoo represent two of the many migratory birds native to the Colorado River ecosystem. Migratory and resident birds in general are severely threatened by dwindling Arizona riparian habitat. Because these birds are associated with native cottonwood and willow forests, revegetation efforts at Cibola NWR are of extreme importance.

Other species found on the Refuge include gray flycatcher, vermillion flycatcher, summer tanager, Arizona Bell's vireo, black-tailed gnatcatcher, black phoebe, black-throated sparrow and song sparrow. Mourning and white-winged dove, amid declining numbers, are two of the Refuge's most numerous species. Gambel's quail are also numerous on the Refuge.

Mammals -- There is a variety of mammals within or adjacent to the Refuge, including: Yuma puma, bobcat, ringtail cat, desert cottontail rabbit, black-tailed jackrabbit, several rodent species and coyote.

Reptiles and Amphibians -- Not much is known of this category of species as no significant studies have been conducted. The Refuge does have populations of bullfrogs and toads, and it is speculated that the Sonoran desert tortoise may thrive in upland areas adjacent to the Refuge.

Imperial NWR Wildlife -- The diversity of avian species on the Imperial NWR is greatest in the spring and fall when both water and land bird migrants are present. Two hundred and five bird species have been recorded on the Refuge since 1942. Resident wildlife indigenous to the Refuge include 29 mammalian species and 47 reptilian and amphibian species.

Endangered Species -- Four Federal endangered avian species are associated with Imperial NWR: brown pelican, Yuma clapper rail, bald eagle, and peregrine falcon. The Southwestern willow flycatcher has been proposed for listing as endangered. Three endangered Colorado River native fishes, the razorback sucker, the bonytail chub, and the Colorado squawfish are believed extirpated within the Refuge portion of the Colorado River. That portion of the Colorado River on Imperial NWR has recently been included in a proposal of critical

habitat designation for the razorback sucker. In addition, several mammalian, avian, reptilian, and amphibian species are currently listed as Federal Candidate species.

State-Listed Species -- Several State-listed avian species are found on Imperial NWR, including but not limited to the following: 1) the California black rail is listed by both the AGFD and the CDFG as endangered; 2) the Arizona Bell's vireo is listed by California as endangered; 3) snowy egrets are listed in Arizona as threatened; and 4) great egrets have endangered status is Arizona. In addition, several mammalian, reptilian and amphibian species occurring on the Refuge are State-listed as endangered, threatened or species of special concern.

Waterfowl -- Imperial NWR serves the Area of Ecological Concern as a wintering area and migrational habitat for Canada geese, snow geese, white-fronted geese, northern pintail, mallard, American wigeon, cinnamon and green-wing teal, gadwall, northern shoveler, common goldeneye, bufflehead, ruddy duck, redhead, lesser scaup and canvasback.

Marsh and Waterbirds -- The significant number of backwater wetlands at Imperial NWR support a variety of marsh and waterbirds throughout the year. This category includes: Greater sandhill crane, double-crested cormorant, white pelican, California black rail, Virginia rail, Yuma clapper rail, great egret, snowy egret, great blue heron, black-crowned night heron, green-backed heron, American bittern and least bittern, and western, pied-billed and eared grebes.

Shorebirds (Gulls, Terns, and, Allied Species) -- These groupings include killdeer, long-billed dowitcher, long-billed curlew, white-faced ibis, wood stork, ring-billed gull, Caspian tern, Forster's tern, American avocet, black-necked stilt, willet, western sandpiper and least sandpiper.

Raptors -- In addition to the bald eagle and peregrine falcon, the following raptors are part of the Imperial NWR wildlife inventory: osprey, northern harrier, Cooper's hawk, sharp-shinned hawk, Harris' hawk, red-tailed hawk, prairie falcon, American kestrel, elf owl, western screech-owl, turkey vulture and burrowing owl.

Other Migrants, Resident, and Wintering Avian Species - As with the other lower Colorado River Refuges, migratory and resident avian species are a critical element to the wildlife inventory at Imperial NWR. These species include: yellow-billed cuckoo, northern gilded flicker, Gila woodpecker, Sonoran yellow warbler, brown-crested, vermillion and ash-throated flycatcher, black phoebe, summer tanager, yellow-breasted chat, blue grosbeak and Abert's towhee. Gambel's quail are very abundant and mourning and white-winged dove, amid declining numbers, remain plentiful at Imperial NWR.

Mammals -- There is a variety of mammals within or adjacent to the Refuge including desert bighorn sheep, mule deer, Yuma puma, bobcat, ringtail cat, desert cottontail rabbit, beaver, muskrat, feral burro and horse and coyote.

Fish -- Waters of the Colorado River and associated backwaters support a variety of warmwater fish. Twenty-three introduced species occur in the River or in adjacent backwater lakes. There are no known extant populations of razorback suckers, Colorado River squawfish or bonytail chub on the Imperial NWR.

Reptiles and Amphibians -- Typical of deserts, this is a numerous and diverse group of organisms on the Refuge. The presence of wetlands provides more habitat diversity and adds to the species list for this group. The lowland leopard frog, a Federal Candidate Category 2 species, is on the edge of its range in the lower Colorado River Valley. The Refuge is within the range of the Sonoran desert tortoise, spiny softshelled turtle, desert iguana, desert collared lizard, western whiptail, chuckwalla, rosy boa and coachwhip. Four species of rattlesnakes are also found on the Refuge: western diamondback, speckled, and Mohave rattlesnakes and sidewinder.

Water Rights

The following is a summary of the current water rights situation at each national wildlife refuge within the Area of Ecological Concern. Water rights for use of Colorado River water were granted in the 1964 Supreme Court Decree in *Arizona v. California* (Decree), and by Secretarial reservation. These waters are regulated and managed by the BR. In the case of the Bill Williams River, which is a tributary of the Colorado River, water rights are granted by the State of Arizona.[36]

Havasu NWR -- Havasu NWR has an entitlement in annual quantities reasonably necessary to fulfill the purposes of the Refuge, not to exceed 41,839 acre-feet of water diverted from the mainstream or 37,339 acre-feet of consumptive use of mainstream water, whichever is less. The priority date for this entitlement is January 22, 1941, for lands reserved by Executive Order 8647, and a priority date of February 11, 1949, for lands reserved by Public Land Order 559.

Bill Williams River NWR -- The Service currently holds three Certificates of Water Rights at the Bill Williams River NWR, allotting a total of 1,110 acre-feet per year. These certificates are allotted by the State of Arizona. Releases from Alamo Dam are regulated and scheduled by the Army Corps of Engineers in consultation with the Service.

Cibola NWR -- The water entitlement for the Cibola NWR was established by a Secretarial Reservation in the Federal Register on December 8, 1982, as follows: "Consistent with the February 9, 1944, contract between the United States and the State of Arizona, notice is given that the following amount of lower Colorado River water is reserved for the United States for use on the Cibola National Wildlife Refuge in Arizona: (1) the diversion of 7,500 acre-feet annually from the mainstream for circulation water, and (2) the diversion of 27,000 acre-feet annually from the mainstream or the consumptive use of 16,793 acre-feet annually from the mainstream, whichever is less, with a priority date of August 21, 1964."

Imperial NWR -- The Imperial NWR has an entitlement in annual quantities reasonably necessary to fulfill the purposes of the Refuge, not to exceed 28,000 acre-feet of water diverted from the mainstream or 23,000 acre-feet of consumptive use of mainstream water, whichever is less, with a priority date of February 14, 1941.

[36]Refer to *Arizona v. California*, a landmark Supreme Court decision which rendered control of Colorado River tributary waters to the States. This decision allowed Arizona to allocate and control water rights from the Gila River and other tributaries of the Colorado River (including the Bill Williams River) while prompting the development of the Central Arizona Project where waters from the main Colorado River channel could be diverted to meet the Colorado River Compact allotment for Arizona.

IV. MANAGEMENT ALTERNATIVES

A. "REFUGES IN ECOSYSTEM" MANAGEMENT FRAMEWORK ALTERNATIVE (PROPOSED/PREFERRED)[37]

This alternative calls for management activities of the four Colorado River national wildlife refuges to be based upon the anticipated impacts of those activities on the defined Area of Ecological Concern. The adoption of the proposed/preferred alternative would result in the implementation of the Lower Colorado River National Wildlife Refuges Comprehensive Management Plan. The proposed/preferred alternative addresses the major ecosystem issues by tying refuge goals and objectives directly to those issues.[38] Biological and public use resource suitability mapping would focus on the refuges as elements of the larger Area of Ecological Concern.

Unlike the No Action alternative, this alternative attempts to integrate the Service's new vision and policy directions including: biological diversity, public outreach, research, and environmental education. The Service is working with the BR and other jurisdictions to develop management strategies that will benefit the entire Area of Ecological Concern. Adoption of the proposed/preferred alternative would result in guidance for the development of these strategies. Implementation of more specific but integrated goals, objectives, and strategies will strengthen fish and wildlife resources, while improving the public's appreciation of those resources. The proposed/preferred alternative offers guidance for the implementation of an integrated approach with regard to biological, public use, law enforcement, and other programs. The implementation of a variety of strategies on the various refuges would be based on natural history, geology, past manipulation, degree of naturalness currently present, and other factors.[39] These factors would be considered in relation to each other.

Implementation of public uses on the refuges will be done from an "Area of Ecological Concern" perspective. In all cases, public use strategies will be employed to improve the public's experience of the refuges' fish and wildlife resources, but these activities must first meet Refuge System compatibility standards and must not conflict with fish and wildlife resource programs. The adoption of the proposed/preferred alternative will result in natural resource strategies that will engender improved public appreciation of the natural resource. For instance, strategies that focus on improvements to water quality will improve a fisherman's experience; and strategies designed to enhance habitat will improve a bird enthusiast's experience. In addition, goals and objectives designed to improve interagency coordination on biological issues and the management of natural resources throughout the Area of Ecological Concern should result in the reduction of public use abuses. Strategies include education, law enforcement, and improved interagency communication.

B. CURRENT MANAGEMENT FRAMEWORK ALTERNATIVE (NO ACTION)

This alternative would continue management of each of the four lower Colorado River national wildlife refuges under current revised goals and objectives. These goals and objectives were initially developed under a Planning Needs Assessment (PNA) process in 1984. Service policy requires that these goals and objectives should be

---

[37]Please refer to proposed goals, objectives and long range management strategies in PART III of the Lower Colorado River National Wildlife Refuges CMP Draft document.

[38]These issues were established as a result of the public involvement scoping meetings referred to in Part IIX of this document. Records of the scoping process are included in the project file and are available for review by the public upon request to the Fish and Wildlife Service, Region 2, Regional Office, Albuquerque, New Mexico.

[39]The term "naturalness" is not intended to simply refer to aesthetic perception. It is a relative term depending on other influences. It has been argued that there are no "natural" areas along the Colorado River any longer because natural ecological processes have been altered and the resulting habitats are functions of river control and dam development. The lower Colorado River national wildlife refuges' planning effort uses the term naturalness in a broader sense taking into account that habitat manipulation techniques will be used to enhance what was a natural process prior to dam construction, channelization and overall river flow control.

revised every five years. The revision process usually entails an updating of current goals and objectives. The process does not necessarily require public involvement. The current goals and objectives for each of the lower Colorado River national wildlife refuges generally pertain to biological and public use programs. Under this alternative, a revised set of goals and objectives would result in very little management strategy changes to achieve the refuge resource goals over the long term. Unlike the "Refuges as Autonomous" Alternative, this alternative calls for the implementation of revised goals and objectives that do not necessarily address the issues brought forth through the scoping process. On the basis of the revised goals and objectives, the individual refuges developed specific revised wildlife output targets. These output projections would delineate species population levels desired over a period of time. The current revised refuge goals and objectives would provide only very basic assistance to the refuge managers with regard to the "compatibility" determination process. Unlike the three other alternatives, goals and objectives arising from the No Action proposal provide only cursory mapping information to the managers for their use in implementing management strategies.

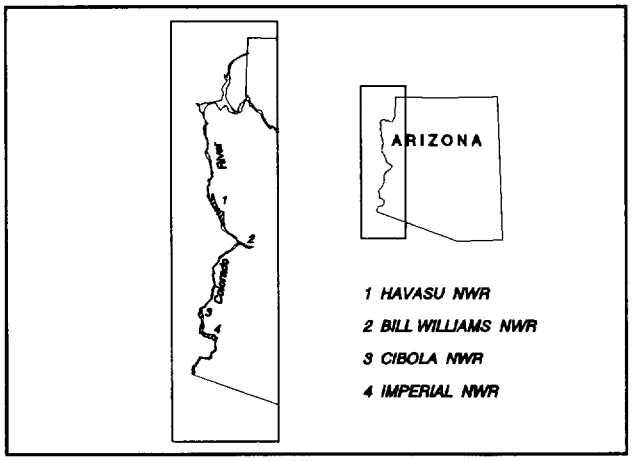
C. "REFUGES AS AUTONOMOUS" MANAGEMENT FRAMEWORK ALTERNATIVE

Unlike the No Action alternative, the "Refuges as Autonomous" alternative would set new goals and objectives to address current refuge issues some of which arose from the scoping process. Adoption of this alternative would involve taking a "zero base" approach toward goal and objective development, as opposed to the simple revision of current goals and objectives as called forth in the No Action alternative. Unlike the No Action alternative and like the proposed/preferred alternative, this alternative would: (1) attempt to integrate the Service's new vision and policy directions, including biological diversity, public outreach, research, and environmental education; and (2) address the problems and opportunities brought forth during the scoping process.

In this alternative, the goals and objectives would be set for each refuge separately. The refuges would be considered as independent land management resources even though adjacent land activities and uses would be taken under consideration. Biological and public use programs would be developed for each refuge based on the specific needs of the respective refuges. Administrative needs would be addressed for each refuge independent of the other refuges. Biological and public use capability mapping would be focused inside the refuge boundaries. Refuges would individually address strategies regarding the sharing of resources and development of cooperative relationships with other agencies and Native American governments. Each of the refuges would submit individual requests to the Regional Office for staffing improvements and annual budget requests.

D. "COMBINATION OF REFUGES" MANAGEMENT FRAMEWORK ALTERNATIVE

This alternative would involve the consideration of the four refuges within the context of upper and lower portions of the Area of Ecological Concern. The upper combination, Havasu and Bill Williams River NWRs, falls within the portion of the River between Davis Dam to the north and Parker Dam to the south. The lower combination, Cibola and Imperial NWRs, falls within the portion of the River between Headgate Rock Dam and Imperial Dam. (See map in figure at right.) From this standpoint, these groupings would be based on their regional proximity to each other as well as the similarity of the



hydraulic and hydrological influences.[40] In addition, the two groupings would allow for the development of strategies that consider a larger ecological context than any one of the refuges represent by themselves. This would allow for the implementation of strategies similar to those of the proposed/preferred alternative, but on a smaller and less comprehensive scale.

[40]Hydrology in this case refers to the properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rocks directly related to rainfall, topography, soil chemistry and porosity. Hydraulics in this case refers to practical applications of water in motion directly related to damming and/or pumping.

V. ENVIRONMENTAL CONSEQUENCES

The following discussions pertain to issues the Service identified in the scoping process, along with a number of issues the NEPA suggests be considered, such as energy efficiency and visual quality. As mentioned earlier in this document, many of those Service-identified management planning issues were combined. Any site specific construction activities or development to occur on the refuges would be subject to additional NEPA analysis and compliance.

A. "REFUGES IN ECOSYSTEM" ALTERNATIVE (PROPOSED/PREFERRED)

1. Biological Diversity, Habitat and Endangered Species Management

In this alternative, habitat and diversity would be addressed from the broader perspective. The refuges would be considered as elements of a larger Area of Ecological Concern. Improvements to habitat and wildlife diversity would result from adoption of this proposed/preferred alternative. These improvements would arise out of focused goals, objectives, and strategies that look at the cumulative problems and opportunities throughout a defined Area of Ecological Concern. Goals and objectives relating to important issues such as revegetation, water management, endangered species management, water quality, and inter-jurisdictional cooperation create the framework for development of more specific management strategies.

This alternative considers that wildlife and vegetation communities, including endangered species, have their own structure aside from any refuge or jurisdictional boundaries. Endangered and other wildlife habitat would have a greater chance of enhancement when given an opportunity to recover within their full ranges in the ecosystem. Although current policy based upon critical habitat determinations require that the refuges participate in endangered fish recovery, this proposed/preferreed alternative would set specific objectives on each of the refuges leading to full participation of the refuges in consideration of each other's efforts with respect to endangered fish recovery on the lower Colorado River. The proposed/preferred alternative would create a framework for the coordination of data gathering, research, and habitat management between the refuges themselves and other natural resource agencies.

2. Energy Efficiency

This proposed/preferred alternative would consolidate energy efficiencies. The expenditure of human and equipment energy could be effectively monitored, taking into account the opportunities for the sharing of resources (human and materiel) and cooperation between government agencies. Efficiencies in scientific data gathering would be improved.

3. Ecological Quality

The proposed/preferred alternative looks at each refuge as a key element of the larger ecological mosaic. Adoption of the alternative would result in improvements to the quality of several ecotypes within the Area of Ecological Concern. In cooperation with the BR and other agencies, the Service would emphasize management strategies that maintain, enhance, and improve the quality of air, water, soil, plant, and animal resources of the refuges. Interagency and inter-refuge cooperation would result in off-refuge monitoring, enhancement, and protection of ecosystem natural resources.

4. Visual Quality

Some short-term visual impacts would occur under this alternative, such as smoke from prescribed burns, presence of heavy maintenance equipment during dike and visitor center construction. Every effort would be made to ensure that management activities minimize these impacts. Structures (signs, buildings, etc.) will be

aesthetically blended with the overall landscape. As indicated earlier, construction activities and specific site development projects would be subject to additional NEPA analysis and compliance.

5. Water Management and Quality

Under the proposed/preferred alternative, overall water quality and delivery would be improved for all four of the refuges. In cooperation with the BR, strategies would be employed that would lessen the amount of water lost to seepage, as well as lessen the possibilities of contaminant loading due to lack of freshening flows. Crop program efficiencies would be greatly improved to include expansion of moist soil management at each of the refuges. This proposed/preferred alternative would prescribe that additional study of selenium sources and other contamination be conducted and that measures be taken to lessen their effects on fish and wildlife.

6. Native Vegetation

This alternative calls for a joint program with the BR to revegetate areas infested with the exotic salt cedar species. A target would be set at approximately 4000 acres to be revegetated with native species by year twenty of the plan. This calculates to about 50 acres per refuge per year. Revegetation with native species, especially native cottonwood and willow trees, would greatly enhance habitat for neotropical migrant and raptor use. In certain circumstances, areas of salt cedar would be revegetated with native plants less prone to use water, such as atriplex, palo verde, and honey-mesquite. This would assist the BR in achieving water savings goals called for in their Vegetation Management Plan.

7. Wetlands

Adoption of this alternative would result in the protection of existing wetlands in accordance with national policy and would result, where possible, in the reconstitution of former wetlands on- and off- refuge lands in cooperation with other appropriate natural resource agencies. This proposed/preferred alternative would set a specific goal for the protection of on-refuge wetlands in cooperation with the BR. The alternative would provide strategies for the reconstitution of former wetlands and would call for the treatment and management of refuge wetlands in consideration of the surrounding larger desert environment. These wetlands are considered to be interconnected and integral with off-refuge wetland values.

8. Compatibility, Refuge Recreation, Harmful Uses, and Law Enforcement

This proposed/preferred alternative would result in the elimination of incompatible refuge uses and lower the incidence of activities harmful to fish and wildlife resources on the refuges and additional enforcement resources. In this alternative, the issue of refuge compatibility is the central and determining factor of all uses on each of the refuges. Implementation of this alternative would result in the disallowing of all uses that are not wildlife-oriented when there is jurisdiction to disallow. In addition, this alternative addresses harmful uses on a larger scale and calls for treatment of problems in cooperation with other jurisdictions. The plan warrants each refuge to implement use-zoning, placement of proper buoys, and appropriate signage to ban entry into sensitive areas. In areas governed by navigable waterway laws, or where concurrent jurisdiction possibly exists, implementation of enforcement activities will be done in cooperation with the apropriate State fish and game departments.

9. Quality of Public Use

As in all the alternatives, each public use will be analyzed for compatibility. This alternative would result in improved public appreciation for fish and wildlife resources. Improvements to inter-jurisdictional cooperation in the area of education and law enforcement would enhance the quality of the wildlife-oriented public uses. Enhanced water quality would also improve the quality of sport fishing on each of the refuges where there is no conflict with endangered fish recovery programs. The alternative would result in improvements to compatible

programs at each of the refuges, including construction of visitor centers, contact stations, foot trails, auto tour loops, and interpretive kiosks, hunt programs, and fishing programs. Projected improvements to native vegetative communities will enhance bird and other wildlife observation opportunities on and off the refuges.

10. Interagency Coordination and Native American Cooperation

The proposed/preferred alternative would result in improvements in the levels of coordination between the Service and other governmental agencies, including Native American governments. The perspective of this alternative is broad and takes into account both the entire Area of Ecological Concern and the various defined jurisdictions overlaid on the area. Enhancements to interagency coordination and relationships with Native American governments are central elements to this proposed/preferred alternative.

11. Cultural Resources

This alternative would provide for an increased level of coordination throughout the Area of Ecological Concern with regard to cultural resource protection efforts. The alternative would offer consistancy in the approaches taken by the refuges as they work more closely with Native American governments, state authorities, and others interested in this issue.

12. Socioeconomics

This alternative would result in the achievement of refuge program continuity for all four refuges. It would also be the basis of continuity between the refuges and other jurisdictions along the Colorado River, including the local communities and economies. The proposed/preferred alternative would result in increased emphasis on environmental education and stronger ties between the refuges and local educators. Under this program, the refuges would begin to act strongly in coordination with each other as participants in community affairs, and would attempt to provide for optimum public appreciation of fish and wildlife resources on and off the refuges. In cooperation with state parks and recreation departments in Arizona and California, as well as the local cities and county recreation programs, standardized efforts would be made to educate the local community about the appropriateness of certain uses on refuges as opposed to a state or national park.

13. Staffing and Funding

The proposed/preferred alternative would result in improvements to refuge funding and staffing. Each of the refuges would maintain their individual project status; however, funding levels for each will be viewed within the context of each other's role on the River. Improvements to staffing and funding for the refuges individually and on the whole, would produce improvements to the refuges' biological programs, public use programs, and law enforcement capabilities. The proposed/preferred alternative would result in improvements to refuge resource sharing in each of these areas.

In an effort to share expertise and monetary resources, the proposed/preferred alternative would result in inter-jurisdictional cooperative agreements.

B. CURRENT MANAGEMENT FRAMEWORK ALTERNATIVE (NO ACTION)

1. Biological Diversity, Habitat and Endangered Species Management

Adoption of the No Action alternative would entail a revision of existing refuge(s) objectives outlined in their individual Planning Needs Assessment document(s). Some benefits would accrue to habitat and wildlife and those improvements would be confined to refuge lands. Missed opportunities to improve habitat and wildlife

on non-refuge areas would result because there would be no formal vehicle to efficiently coordinate efforts with other jurisdictions.

Adoption of this alternative would result in revised versions of current refuge(s) objectives which are based primarily on wildlife population levels. This alternative does not preclude the development of long-range management strategies and more specific program operational plans. This alternative would focus on single species management approaches resulting in some benefits for individual species, however, there would be missed opportunities to achieve cumulative enhancement of biological diversity, habitat, and endangered species management throughout the Area of Ecological Concern.

2. Energy Efficiency

In this alternative, each refuge would attempt to achieve optimum efficiencies in the expenditure of fuel and other energy resources on an individual basis. The refuges would not take into account the efficiencies that could be achieved if resources were strategically shared. Expenditure of human and materiel resources by the Service could be monitored on a refuge-to-refuge basis in an effort to eliminate waste. The primary focus of the individual refuges on the interior of the refuge might not prompt strategic development of cooperative agreements with other jurisdictions in the Area of Ecological Concern which could optimize energy efficiencies.

3. Ecological Quality

Because this alternative focuses on objectives for specific species populations instead of broader habitat enhancement objectives, continued fragmentation of the ecosystem would result. For instance, salt cedar infestation would continue to overpower native vegetation because the alternative offers no specific management strategies to address the broader land and water quality (ecological) issues. The refuges would continue to operate independently from each other without a sense of the cumulative effects of refuge activities on the ecosystem, and with separate, although similar, objectives.

This alternative would provide no formalized opportunity for strategic development of cooperative relationships with other jurisdictions and interests. Refuge relationships with other jurisdictions would be *ad hoc*.

4. Visual Quality

Under this alternative, projects would occur on the refuges that would cause minor, short term visual impacts. Activities such as dredging and farm maintenance would call for use of heavy equipment, although management would make every effort to ensure that impacts on visual quality would be minimized. As with all alternatives, construction activities and specific site development projects would be subject to additional NEPA analysis and compliance. The quality of signs, buildings, and other structures would probably not improve because the current planning documents contain no formalized strategies that would result in the needed funding, staff improvements, or improvements to the physical plants.

5. Water Management and Quality

As refuge objectives are species based rather than habitat based, no objective would specifically address degradation of water quality and water management efficiencies on the refuges. Any efforts to deal with issues such as seepage, selenium contamination, degraded fish habitat, low quality fisheries, and other water quality problems would continue to be *ad hoc* and dependent on priorities set by the individual refuge managers. The result would be continued degradation of refuge water resources. In addition, this alternative would not provide stated direction for the refuges to actively develop cooperative agreements with other jurisdictions to address a full range of opportunities and problems.

6. Native Vegetation

As in the case of water management and quality, refuge objectives would not specifically address habitat maintenance and improvement problems and opportunities. In addition, this alternative does not strategically define avenues leading toward the achievement of the inter-jurisdictional cooperation necessary to successfully control exotic vegetation and to revegetate with native plants. Salt cedar infestation is a growing problem on and off the refuges within the Area of Ecological Concern. Riparian habitat improvement would be "spotty," and consequently, migrant, resident, and wintering raptors and song bird species would continue to be extirpated from their natural environment.

7. Wetlands

Objectives in this alternative would not define specific wetland maintenance and restoration objectives. There may be slight improvements to the number of wetland acres on the refuges, but that would be subject to an individual refuge manager's priorities. Adoption of this alternative would not result in the necessary level of inter-jurisdictional cooperative efforts leading to the optimum wetland maintenance and restoration efforts on and off the refuges.

8. Compatibility, Refuge Recreation, Harmful Uses, and Law Enforcement

Under the new policy guidance, allowable use compatibiliity would need to be integrated into all secondary use program activities on the refuges. Refuge public use decisions will be based on that policy. This alternative's objectives for each of the refuges, however, do not provide a direct link between the respective refuge natural resource objectives and how secondary use decisions are made.

The alternative would focus on the interior of the refuge borders. Adoption of the alternative would not provide for strategic development of cooperative ventures between jurisdictions and the refuges, and between the refuges themselves. The individual refuges would continue to address the growing number of harmful recreational users on a refuge by refuge basis.

9. Quality of Public Use

This alternative would not provide strategies to monitor the cumulative effects of allowable public uses for all on refuges. This alternative would not provide strategies for cooperative efforts with other jurisdictions to curb or slow the effects of harmful uses that affect all wildlife-oriented recreation on and off refuges. Opportunities for strategic sharing of law enforcement resources along the River would be subject to individual refuge manager priority. Under this alternative, strategies for the development of interpretive materials for the refuges and lands managed under other jurisdictions would be *ad hoc*.

10. Interagency Coordination and Native American Cooperation

Under this alternative, there would be no inter-refuge strategy for the development of enhanced interagency coordination. The refuges' relationships with other jurisdictions and the Native American governments would depend on the individual managers' sense of priorities relative to a specific issue.

11. Cultural Resources

Under this alternative, objectives do not provide for the implementation of specific cultural resource protection strategies. Strategies would be implemented on a refuge to refuge basis and could not take into account the full range of movement and overlap of ancient cultures present throughout the lower Colorado River region. Coordination between the refuges, the Native American governments, and other interested parties with respect

to data gathering and strengthening protection efforts would depend upon refuge manager priorities. This alternative does not provide a means to track any progress in the refuge and non-refuge cultural resource values throughout the lower River.

12. Socioeconomics

Under this alternative strategies to develop stronger relationships with local communities would be subject to individual refuge manager priorities. This would lessen the interest in the local economies to integrate the refuges into their overall socioeconomic landscape.

13. Staffing and Funding

This alternative would provide little or no strategies which would justify increases in staffing and funding. The refuge goals under this alternative call for improvements and enhancements in all programs, but the alternative would not lay out a long-range strategy for accomplishment. The refuges would continue to operate with minimum levels of funding, and each refuge would have to compete against each other and all other national wildlife refuge programs system-wide.

C. "REFUGES AS AUTONOMOUS" ALTERNATIVE

1. Biological Diversity, Habitat, and Endangered Species Management

Under this alternative, habitat and wildlife diversity improvement and endangered species management would be addressed directly as Comprehensive Management Plan objectives. Habitat and diversity would be addressed from the perspective of the immediate refuge environment (i.e., the refuge and adjacent lands). Only lands immediately adjacent to the refuge would be taken into consideration with this alternative.

In the short term, goals and objectives would result in more focused management strategies than exist under the No Action alternative; however, in the long run these autonomously managed resources will be focused on their own programs and immediate environment and not the larger ecosystem. Each refuge would justify its own internal needs and would have to compete with each other for resources. Although some improved interagency coordination would be possible under this alternative, efficiencies could be lost and redundancy would result.

Habitat conservation and restoration would be limited to noncontiguous pockets along the River. Efforts to achieve biological diversity on the separate refuges would be difficult since the achievement of biological diversity necessarily entails the inclusion of natural units of the ecological make-up of an area as opposed to artificially defined areas. Although efforts to improve the situation for endangered species on the refuges would continue to be strong, this alternative would not foster a spirit conducive to information and resource sharing leading to duplication of effort and other inefficiencies.

2. Energy Efficiency

Like the No Action alternative, this management alternative would not necessarily take into account the efficiencies which would be achieved if resources were strategically shared between the refuges. Through new goals and objectives, each refuge would be directed to employ policies resulting in energy conservation; however, there would be no mechanism under this alternative to monitor duplication of effort between the refuges.

3. Ecological Quality

This alternative would set out goals and objectives for each refuge that would call for strategies to improve ecological quality. However, this alternative would not foster a formal interagency cooperative effort designed

into these strategies. In the long term, there would continue to be no formal mechanism in place leading to coordinated decision-making processes among the refuges and the resource agencies.

4. Visual Quality

Under this alternative, projects would occur on each of the refuges that would cause minor, short term visual impacts. Activities such as dredging and farm maintenance would call for use of heavy equipment, although management would make every effort to ensure that impacts on visual quality would be minimized. This alternative would call for improvements to signs, buildings, and other structures on each of the refuges. As with all alternatives, construction activities and specific site development projects would be subject to additional NEPA analysis and compliance.

5. Water Management and Quality

This alternative would result in goals and objectives for water quality improvements on the individual refuges. Such improvements would lessen the amounts of water lost to seepage, as well as the possibilities of contaminant loading due to lack of flows.

As in the case of the No Action alternative, each refuge would coordinate efforts separately with the BR with regard to water levels, river maintenance on refuges, and biological programs. Under this alternative, new water management and quality goals, objectives, and strategies would be implemented for each of the refuges. These would address both water management and quality problems and opportunities on the respective refuges. Water quality would most likely be enhanced in the short term, thus improving the habitats for fish and waterbirds. With improved irrigation systems under this alternative, moist soil management strategies for each of the refuges would be expanded.

6. Native Vegetation

This alternative would set specific goals for each refuge regarding acres to be enhanced through salt cedar removal and subsequent revegetation. Coordination between the refuges and the BR would be done by each of the refuge managers. Like the proposed/preferred alternative, targets could be set at 50 acres per year for each refuge throughout the 20-year planning cycle.

Revegetation with native species, especially native cottonwood and willow trees, would enhance habitat for neotropical migrant and raptor use. Under this alternative, there would be improvements over the current habitat situation. This would improve on-refuge biological diversity, and would call for enhanced protection of existing native vegetation on the refuges, as well as the revegetation program noted above.

7. Wetlands

This alternative would set a specific goal for the protection of on-refuge wetlands, and would set objectives that provide for the reconstitution of former wetlands. Unlike the proposed/preferred alternative, and like the No Action alternative, each refuge would have to coordinate efforts separately with BR officials with respect to their specific projects. Lack of strategic cooperation could lessen the benefit of an ecosystem-wide wetlands protection initiative.

8. Compatibility, Refuge Recreation, Harmful Uses, and Law Enforcement

Like the proposed/preferred alternative, this alternative would address the issue of refuge compatibility as the central and determining factor of all uses on each of the refuges. This alternative would call for disallowing all uses that are not wildlife oriented when there is jurisdiction to disallow such use. The proposed plan would

attempt to address the problems and opportunities regarding non-wildlife oriented public use such as jet skiing, water skiing, and high speed boating. Each refuge plan would call for additional law enforcement staffing to protect the refuge resources.

This problem applies mainly to Havasu NWR, Imperial NWR and to some degree Cibola NWR. Under this alternative, these three refuges would set their own goals in an effort to regulate this kind of public use in the main channel of the River. Such use would be banned in the backwater marshes of all these refuges.

If implemented, this alternative would produce some improvements in control of harmful uses of the main River channel and backwater marsh areas. Additional law enforcement staffing would be required.

Unlike the proposed/preferred alternative, however, the refuge goals would pertain simply to refuge areas, even though the harmful use issue goes beyond the Service's capabilities to resolve it alone. In order to bring about effective regulation to deter harm to critical habitat areas, each of the refuges would have to create their own cooperative mechanisms with other jurisdictions.

9. Quality of Public Use

This alternative would enhance the public's appreciation for fish and wildlife resources by continuing and strengthening wildlife-oriented public use activities on the individual refuges. Improvements to interpretive programs would be made for each of the refuges separately, including construction of visitor centers, contact stations, foot trails, auto tour loops, and interpretive kiosks. As with all alternatives, construction activities and specific site development projects would be subject to additional NEPA analysis and compliance. Each refuge would be compete for funding and resources regionally and nationally to make these improvements.

10. Interagency Coordination and Native American Cooperation

In an effort to improve refuge programs, each of the refuges would be responsible for the development of their own relationships with the various surrounding jurisdictions. The long term outcome might be the lack of desireable levels of inter-jurisdictional cooperation.

11. Cultural Resources

Under this alternative, there would be improved efforts on a refuge-by-refuge basis to coordinate cultural resource activities with the Native American governments and other interested parties, with respect to strengthening protections of the refuge and non-refuge cultural resources. Each refuge would develop an autonomous comprehensive strategy for such coordination.

12. Socioeconomics

This alternative would result in each of the refuges developing their own relationships with surrounding economies. Each of the refuges would provide for increased emphasis on environmental education and would call for the strengthening of ties between the refuges and local educators. Individually, the refuges would begin to act as participants in community affairs and provide for optimum appreciation of fish and wildlife resources.

Like the proposed/preferred alternative, this alternative would provide strategies to develop stronger relationships with local communities. Public use programs would be somewhat enhanced to improve the quality of the public use experience; this would, in turn, increase the interest in the local economies to promote the refuges as part of their tourism programs.

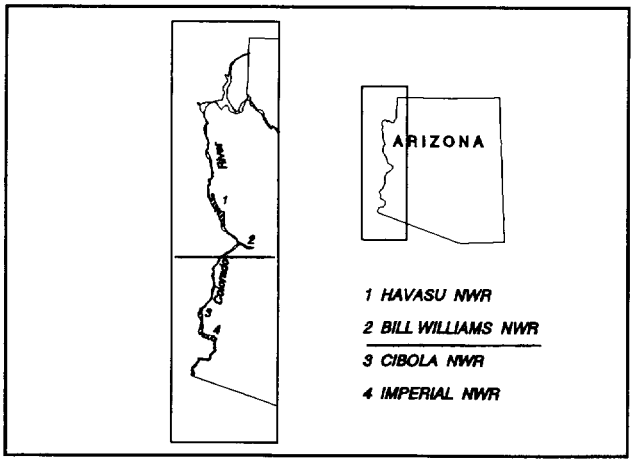
13. Staffing and Funding

Each of the refuges in this alternative would propose its own schedule of staffing and funding needs for the next 20 years. Each refuge would have to annually justify the need for funding in competition with one another.

C. "COMBINATION OF REFUGES" ALTERNATIVE

1. Biological Diversity, Habitat, and Endangered Species Management

This alternative is similar in some ways to the proposed/preferred alternative. The management strategies, however, would address refuge problems and opportunities in two separate segments of the River. These segments are described as follows: (1) The upper segment, between Davis Dam on the north and Parker Dam on the south, would include Havasu and Bill Williams River NWRs. (2) The lower segment, between Headgate Rock Dam on the north and Imperial Dam on the south, would include Cibola and Imperial NWRs. (See map in figure at right.)



As in the case of the proposed/preferred alternative, habitat and wildlife diversity would be addressed by each of the refuge combinations. In order to address wildlife and habitat problems, opportunities, goals, objectives, and long-range management strategies would be implemented for each combination of refuges. As stated in the proposed/preferred alternative, wildlife and vegetation communities, including endangered species, have their own structure aside from the refuge or any artificially described jurisdictional boundaries. In this alternative, the environmental setting of each respective segment is considered to be influenced by the water release and management regimes of the two described segments. Thus, when considered as elements of a river segment, the refuges could implement strategies that would provide for increased levels of other jurisdictional cooperation within their respective segment of the River. Each segment would evaluate and implement, where possible, strategies for the management of endangered Colorado River fishes, as well as a full range of threatened native wildlife. This alternative would create a framework for the coordination of data gathering, research, and habitat management between the refuges themselves and other natural resource agencies.

While this alternative would result in positive ecological outcomes, it would not ensure the ability of each of the refuge combinations to deal efficiently with problems and opportunities that go beyond water management regimes (i.e., desert wilderness management, contaminants, recreational abuses, etc.). Implementing two distinct refuge combination programs would not allow for the full range of resource sharing possibilities. It would not allow for the level of interagency cooperation necessary to meet habitat and wildlife needs on and off the refuges. These habitat and wildlife needs permeate the entire lower Colorado River without respect to hydrological regimes. Even though water management regimes differ in terms of releases, hydrology, and quality, the structure and mix of the wildlife and habitat communities in the riparian area differ very little. Segmenting the River in this fashion would artificially fragment the natural makeup of the riparian habitat and wildlife communities.

While it is a better alternative than the No Action or the "Refuges as Autonomous" alternatives, it: (1) does not engage a full spectrum of interagency cooperative opportunities as would the proposed/preferred alternative, and

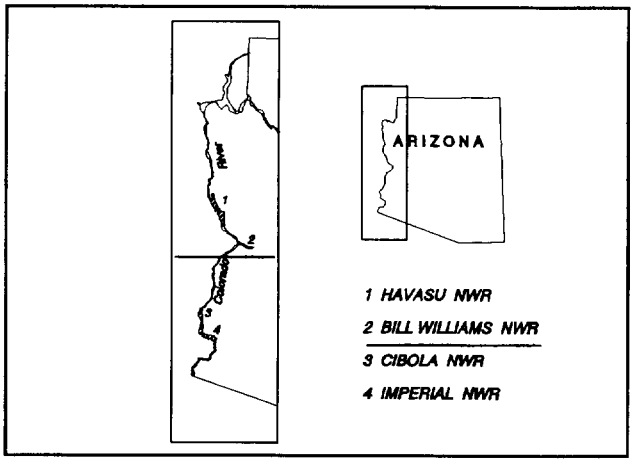
13. Staffing and Funding

Each of the refuges in this alternative would propose its own schedule of staffing and funding needs for the next 20 years. Each refuge would have to annually justify the need for funding in competition with one another.

C. "COMBINATION OF REFUGES" ALTERNATIVE

1. Biological Diversity, Habitat, and Endangered Species Management

This alternative is similar in some ways to the proposed/preferred alternative. The management strategies, however, would address refuge problems and opportunities in two separate segments of the River. These segments are described as follows: (1) The upper segment, between Davis Dam on the north and Parker Dam on the south, would include Havasu and Bill Williams River NWRs. (2) The lower segment, between Headgate Rock Dam on the north and Imperial Dam on the south, would include Cibola and Imperial NWRs. (See map in figure at right.)



As in the case of the proposed/preferred alternative, habitat and wildlife diversity would be addressed by each of the refuge combinations. In order to address wildlife and habitat problems, opportunities, goals, objectives, and long-range management strategies would be implemented for each combination of refuges. As stated in the proposed/preferred alternative, wildlife and vegetation communities, including endangered species, have their own structure aside from the refuge or any artificially described jurisdictional boundaries. In this alternative, the environmental setting of each respective segment is considered to be influenced by the water release and management regimes of the two described segments. Thus, when considered as elements of a river segment, the refuges could implement strategies that would provide for increased levels of other jurisdictional cooperation within their respective segment of the River. Each segment would evaluate and implement, where possible, strategies for the management of endangered Colorado River fishes, as well as a full range of threatened native wildlife. This alternative would create a framework for the coordination of data gathering, research, and habitat management between the refuges themselves and other natural resource agencies.

While this alternative would result in positive ecological outcomes, it would not ensure the ability of each of the refuge combinations to deal efficiently with problems and opportunities that go beyond water management regimes (i.e., desert wilderness management, contaminants, recreational abuses, etc.). Implementing two distinct refuge combination programs would not allow for the full range of resource sharing possibilities. It would not allow for the level of interagency cooperation necessary to meet habitat and wildlife needs on and off the refuges. These habitat and wildlife needs permeate the entire lower Colorado River without respect to hydrological regimes. Even though water management regimes differ in terms of releases, hydrology, and quality, the structure and mix of the wildlife and habitat communities in the riparian area differ very little. Segmenting the River in this fashion would artificially fragment the natural makeup of the riparian habitat and wildlife communities.

While it is a better alternative than the No Action or the "Refuges as Autonomous" alternatives, it: (1) does not engage a full spectrum of interagency cooperative opportunities as would the proposed/preferred alternative, and

(2) does not engender the full range of habitat/wildlife enhancement and protection possible as would the proposed/preferred alternative.

2. Energy Efficiency

This alternative would consolidate energy efficiencies within the respective refuge combination areas. As in the case of the proposed/preferred alternative, the expenditure of human and equipment energy could be monitored taking into account the opportunities between the refuges to share resources (human and material) and to cooperate with other jurisdictions. The focus regarding the realization for energy efficiencies, however, would be on the refuge combinations and not the four refuges cumulatively. The total amount of efficiency possible over the long term would be less because of the increased duplication of effort between the two refuge combinations. Increased competition might cause a lack of communication between the refuges, resulting in decreased energy efficiencies.

3. Ecological Quality

This alternative looks at each refuge in the context of the larger hydrological and hydraulic influences. The refuges are grouped together in combinations based on hydraulic regimes. This would lend to improved measures of ecological quality than would occur otherwise when considering the refuges autonomously. This alternative would not, however, foster the full range of formal interagency cooperative efforts designed to address issues from Davis Dam to the Gulf of California in Mexico. Consequently, the segmentation of the refuges in this configuration would create mechanisms for more competition and less cooperation between resource jurisdictions.

4. Visual Quality

Under this alternative, projects would occur on each of the refuge combinations that would cause minor, short term visual impacts. Activities such as dredging and farm maintenance would call for use of heavy equipment, although management would make every effort to ensure that impacts on visual quality would be minimized. This alternative would call for improvements to signs, buildings, and other structures in each of the refuge combinations. As with all alternatives, construction activities and specific site development projects would be subject to additional NEPA analysis and compliance.

5. Water Management and Quality

As in the case of the proposed/preferred alternative, water delivery and overall water quality would be improved on all four of the refuges. Refuge water management would be addressed on the basis of hydrological and hydraulic factors present in the respective segments of the River. In cooperation with the BR, the Service would implement strategies that would lessen the amounts of water lost to seepage, evapotranspiration, and evaporation, as well as lessen the possibilities of contaminant loading due to lack of freshening flows. As in the case of the proposed/preferred alternative, crop program efficiencies would be improved to include expansion of moist soil management at each of the refuges.

In the long term, however, the water management and quality problems and opportunities shared by the areas interspersed between the refuge combinations would not be adequately addressed. The resulting lack of coordination would lessen the gains in the end.

6. Native Vegetation

This alternative would set specific goals for each combination of refuges regarding the quantity of acreage to be enhanced through salt cedar removal and subsequent revegetation. Coordination between the refuge

combinations and the BR would be done by the respective combinations. Like the proposed/preferred alternative, targets could be set at 50 acres per year, per refuge throughout the 20-year planning cycle.

Revegetation with native species, especially native cottonwood and willow trees, would enhance habitat for neotropical migrant and raptor use. Under this alternative, there would be improvements over the current habitat situation. This would improve on-refuge biological diversity, and would call for enhanced protection of existing native vegetation on the refuges as well as the revegetation program noted above.
As in the case of the "Refuges as Autonomous" Alternative, the levels of refuge/other agency coordination would fluctuate, lessening the effectiveness that could be provided by an alternative wherein coordination between agencies is paramount.

7. Wetlands

This alternative would set cumulative goals for the protection of wetlands for the respective refuge combinations. Objectives would be set to provide for the reconstitution of former wetlands as well. Unlike the proposed/preferred alternative, each refuge combination would have to coordinate efforts separately with BR officials with respect to their specific projects. In the long run, a lack of strategic cooperation inclusive of areas interspersed between the refuge combinations would lessen the benefit of a cumulative wetlands protection initiative.

8. Compatibility, Refuge Recreation, Harmful Uses and Law Enforcement

Like the proposed/preferred alternative, this alternative would address the issue of refuge compatibility as the central and determining factor of all uses on each of the two refuge combinations. This alternative would call for discontinuing all public uses that are not wildlife oriented. The proposed plan would attempt to address the problems regarding non-wildlife oriented public use such as jet skiing, water skiing, high speed boating, etc. Each refuge combination's plan would call for additional law enforcement staffing to protect the refuge resources.

Under this alternative, the refuge combinations would set their own goals in an effort to regulate this kind of public use in the main channel of the River. If implemented, this alternative would produce some improvements in control of harmful uses of the main river channel and backwater marsh areas. Additional law enforcement staffing would be required.

Unlike the proposed/preferred alternative, the refuge goals would pertain simply to refuge combination areas even though the harmful use issue goes beyond the Service's capabilities to resolve it alone. Each of the refuge combinations would have to create their own cooperative mechanisms with other jurisdictions in order to bring about effective regulation to deter harm to critical habitat areas for endangered and other species.

9. Quality of Public Use

This alternative would enhance the public's appreciation for fish and wildlife resources by continuing and improving wildlife-oriented public use activities on the individual refuges. Improvements to interpretive programs would be made for each of the refuges, including construction of visitor centers, contact stations, foot trails, auto tour loops, and interpretive kiosks. This alternative would not provide for the needed interagency cooperation relative to other natural resource agency recreational programs interspersed between the refuge lands from Davis Dam to the U.S.- Mexico border. As with all alternatives, construction activities and specific site development projects would be subject to additional NEPA analysis and compliance.

10. Interagency Coordination and Native American Cooperation

This alternative would provide goals and objectives relative to interagency coordination with the various refuge combinations. Each of the refuge combinations would be responsible for the development of their own relationships with the various surrounding jurisdictions in an effort to improve refuge programs. As in the case of the "Refuges as Autonomous" Alternative, the long-term outcome would be the lack of optimum levels of inter-jurisdictional cooperation and increases in redundancy. This would result in a continuation of fragmented efforts on the part of all agencies to accomplish their respective goals and obectives, as well as persisting public use abuses, salt cedar infestation, species extirpation, and degradation of water quality, habitat quality, and the quality of wildlife-oriented public use.

11. Cultural Resources

This alternative would provide for enhanced coordination throughout the Area of Ecological Concern with regard to cultural resource protection efforts and would lend to consistancy in the approaches taken by the refuges.

12. Socioeconomics

This alternative would result in each of the refuge combinations developing their own relationships with surrounding economies. Each of the refuge combinations strategies would foster increased emphasis on environmental education and call for the strengthening of ties between the refuges and local educators. The refuge combinations would begin to act strongly as participants in community affairs and provide for optimum appreciation of fish and wildlife resources.

Like the proposed/preferred alternative, this alternative would provide strategies to develop stronger relationships with local communities. Under this alternative, public use programs would be enhanced to improve the quality of the public use experience; this would, in turn, increase the interest in the local economies to promote the refuges as part of their tourism programs.

13. Staffing and Funding

Each of the refuge combinations in this alternative would propose a schedule of staffing and funding needs for the next 20 years. Staffing and funding would be considered for each refuge individually as they fit in the context of the respective combinations. For example, this alternative does not intend to aggregate funding for Cibola and Imperial NWRs as one project, but rather looks at the funding levels of each of the refuges in the context of one another. The refuge would still have to annually justify the need for funding in competition. It is likely that even with goals and objectives that have arisen from the public involvement process, the outcome would be only slightly better than what currently occurs for these refuges.

VI. CUMULATIVE IMPACTS

A. "REFUGES IN ECOSYSTEM" ALTERNATIVE (PROPOSED/PREFERRED)

Adoption of the proposed/preferred alternative would not result in any significant impacts, cumulative or otherwise. However, as each of the management strategies are implemented, consideration must be given on a site-by-site basis to any potential significant impacts which would contribute to a cumulative effect throughout the "area of ecological concern."

B. NO ACTION ALTERNATIVE

The perspective of this management alternative is one that emphasizes the refuges individual and separate capabilities under current but minimally revised objectives. This perspective would result in the continuation of inter-refuge competition for fiscal resources, and cooperative efforts would be completely dependent on the refuge manager's priority of issues. However, adoption of the "No Action" Alternative would not result in any significant impacts, cumulative or otherwise. As each of the management strategies are implemented, consideration would be given on a site-by-site basis to any potential significant impacts which would contribute to a cumulative effect throughout the "area of ecological concern."

C. "REFUGES AS AUTONOMOUS" ALTERNATIVE

Even though the alternative calls for enhanced refuge objectives, the perspective of this management alternative is one that emphasizes the refuges individual capabilities and resources rather than their capabilities as elements of a larger ecosystem. Like the "No Action" Alternative, this perspective would result in the continuation of inter-refuge competition for fiscal resources, and cooperative efforts would be completely dependent on the refuge manager's priority of issues. However, adoption of the "Refuges as Autonomous" Alternative would not result in any significant impacts to the human environment, cumulative or otherwise. As each of the management strategies are implemented, consideration would be given on a site-by-site basis to any potential significant impacts which would contribute to a cumulative effect throughout the "area of ecological concern."

D. "COMBINATION OF REFUGES" ALTERNATIVE

In the long-term this perspective would result in a split between programs pertaining to one refuge combination versus the other. An increase in competition between refuge resources would affect the level of desireable cooperation between the refuges and other jurisdictions. Nevertheless, adoption of the proposed/preferred alternative would not result in any significant impacts, cumulative or otherwise. However, as each of the management strategies are implemented, consideration must be given on a site-by-site basis to any potential significant impacts which would contribute to a cumulative effect throughout the "area of ecological concern."

VII. MITIGATION AND RESIDUAL IMPACTS OF THE PROPOSED/PREFERRED ACTION

No mitigation action would be necessary in the adoption and implementation of the proposed/preferred action. Where site development activities will be proposed during the next 20 years, each activity would be given the appropriate NEPA consideration. At that time, any required mitigation activities would be designed into the specific project to reduce any significant adverse impacts to the human environment and preserve the resources (i.e., future dike construction projects, future visitor center construction activities, future road developments and improvements, etc.).

IIX. CONSULTATION AND COORDINATION

This project was undertaken by the U.S. Fish and Wildlife Service, Region 2, with full cooperation of the U.S. Bureau of Reclamation, Lower Colorado River Region.

During the planning process, meetings were held with the following agencies and organizations: Arizona Game and Fish Department; California Department of Fish and Game; Nevada Department of Wildlife; California Department of Parks and Recreation; Arizona State Parks; BLM; Bureau of Indian Affairs; Department of the Air Force; Chemehuevi Indian Tribe; Fort Mojave Indian Tribe; Colorado River Indian Tribe; City of Lake Havasu, Arizona; City of Blythe, California; City of Needles, California; Colorado River Environmental and Wildlife Society (Martinez Lake, Arizona); Sierra Club; Audubon Society; Yuma Rod and Gun Club; Palo Verde Rod and Gun Club; Lake Havasu City Chamber of Commerce; Parker Arizona Chamber of Commerce; Golden Shores/Topock Chamber of Commerce; Arizona Wildlife Federation; Arizona Department of Environmental Quality; Arizona Department of Water Resources; Arizona State Lands Department; Arizona Nature Conservancy; Lake Havasu City Bass Club; and Arizona Trappers Association.

The U.S. Bureau of Reclamation, the cooperating agency in this project, has been consulted consistently during the planning process.

In addition, public meetings were held as follows:

August 28, 1991, Yuma, Arizona
August 29, 1991, Blythe, California
August 30, 1991, Lake Havasu City, Arizona
August 31, 1991, Needles, California

A full list of those in attendance is available along with transcripts of these public meetings. This information is made a part of this project file.

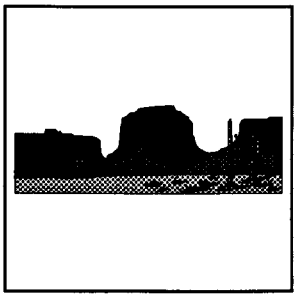
IX. LIST OF PREPARERS

U.S. Fish and Wildlife Personnel
Tom Baca, Natural Resource Planner, Refuges and Wildlife
Jim Good, Manager, Havasu NWR
Wes Martin, Manager, Cibola NWR
Nancy Gilbertson, Bill Williams River NWR
Andy Loranger, Imperial NWR
Dick Steinbach, Program Specialist, Arizona Refuges
Nita M. Fuller, Associate Manager, Arizona/New Mexico Refuges
Joseph P. Mazzoni, Assistant Regional Director, Refuges and Wildlife, Region 2
Jill Simmons, Writer-Editor, Division of Realty
Rafael Fernandez, Cartographer, U.S. Fish and Wildlife Service, Region 2

Bureau of Reclamation Personnel
Tom Shrader, Chief Biologist, U.S. Bureau of Reclamation, Lower Colorado River Region
Bill Martin, U.S. Bureau of Reclamation, Lower Colorado River Region
Glen Gould, U.S. Bureau of Reclamation, Lower Colorado River Region
Bill Weisenborn, U.S. Bureau of Reclamation, Lower Colorado River Region
Dave Gudgel, U.S. Bureau of Reclamation, Yuma Projects Office
Gary Ferrier, U.S. Bureau of Reclamation, Yuma Projects Office
Harold Pritchett, U.S. Bureau of Reclamation, Yuma Projects Office

X. GOALS AND OBJECTIVES[41]

INTRODUCTION



Refuge goals and objectives have been developed in consideration of: (1) the legal mandates including statutes, policies, and other administrative directives; (2) the purposes for which the refuges were established; (3) the goals of the National Wildlife Refuge System; and (4) an analysis of defined issues outlined on page 7 of this document. Programmatic objectives were developed in consideration of field level analysis offered by the lower Colorado River refuge managers, specific input from the public, private conservation organizations, and other governmental agencies. These objectives are also intended to address the major issues that surfaced during the planning process.

The details of special project activity strategies and specific wildlife and public use numerical objectives are listed in an Appendix available on request. These evolved out of the refuge managers' informal analyses prior to this planning process, and were developed to be consistent with the recommended programmatic objectives.

REFUGE GOALS AND OBJECTIVES[42]

The list of 17 issues outlined on pages 6 and 7 of this document are repeated below, each with goals and objectives. This list is not exclusive, and there may be issues not addressed singularly, but in combination with other issues. For instance, the effect of the Navigable Waterways Act on regulation of water sport activities is an issue considered within the context of jurisdictional rights, compatibility, and public recreational issues. In fact, all of the issues are in some way interrelated.

As the planning horizon is 20 years, the Service has much latitude with respect to project phasing and implementation. However, a suggested project phasing is also offered. Specific public use objectives in this plan will be subject to final determinations contained in a Public Use Management Plan yet to be developed. Project compatibility, scope, and location will be determined in the step-down management plan. Funding considerations will also affect implementation.

ISSUE #1: Biological Diversity and Habitat Management

Goal #1: In cooperation with other resource management agencies, to restore and maintain the natural diversity of the Colorado River Area of Ecological Concern, especially on refuge lands.

Objectives:

(1) Determine specific scientific research data needs (related to land and aquatic ecosystems) for each of the lower Colorado River national wildlife refuges, produce an inventory of those specific

---

[41]This section is taken directly from PART III (Synthesis) of the Lower Colorado River National Wildlife Refuges Comprehensive Management Plan document. In addition, the plan document includes a narrative outline of each of the refuges' long-range management approaches. Each of the approaches are drawn directly from the Goals and Objectives iterated here.

[42]The list of goals as in the case of the issues listed on pages 6 and 7 of this document are not in any order of specific priority. However, they are ordered to indicate that natural resource issues and goals take precedence by virtue of the ordering of the Goals of the National Wildlife Refuge System. **[Refuge Manual 2 RM 1-4]**

needs, and develop a coordinated strategy for meeting those needs. The inventory of needs should be prepared in cooperation with other resource management agencies and institutions of higher learning and research. Strategies should result in increased cooperative research through institutions or enhancement of refuge biological staffs. Research is a specific priority and promotes a better understanding of the land and aquatic habitat needs of various endangered species, interjurisdictional fishery resources, and all migratory bird species, especially those in danger of extirpation from the lower Colorado River Area of Ecological Concern. **[Year 2]**

(2) Improve scientific information bases including improvements to refuge understandings of land ownership, vegetation structures, geological and hydrological regimes, wildlife uses, and other natural resource data bases. Coordination with other agencies in the use of Geographical Information Systems, aerial photography, and other strategies is essential. Agencies include the National Biological Survey, the Arizona Game and Fish Department, and the Bureau of Reclamation (among others). **[Year 1-10]**

(3) Achieve higher levels of scientific information consistency by developing and strengthening cooperative efforts between the refuges and other Area of Ecological Concern jurisdictions (including private landowners). **[Year 1-10]**

(4) Achieve improved levels of international habitat conservation by increasing dialogue with Mexico, using the appropriate channels and legal mechanisms, concerning lower Colorado River biological diversity and endangered species. **Target: Mexico/U.S. meeting once every 2 years. [Years 1-20]**

(5) Improve long-term viability of fish and wildlife resources by developing and fostering long-term research that improves monitoring and identification of nongame fish and wildlife, certain types of habitats and other elements which contribute to overall biological diversity. **Target: Consistent wildlife inventory database for each lower Colorado River refuge. [Year 5]**

(6) Increase awareness of the importance of resident and migratory songbird values by developing new and strengthening existing educational and interpretive programs that emphasize these values along the River. **Target: Development of refuge specific and Area of Ecological Concern interpretive displays, leaflets, videos, educational materials for use in schools, and other strategies. [Years 1-3]**[43]

(7) Increase viability of threatened stands of native vegetation by identifying and targeting essential cottonwood, willow, and other native tree galleries on and off refuge lands that are in need of fire prevention strategies. Enhance existing refuge fire management plans to include an ecosystem-wide fire management perspective. This effort should be conducted in cooperation with other jurisdictions. **[Year 3]**

(8) Enhance habitat diversity by implementing special project and protection strategies detailed in **Appendix A**, attached to this document, and Objective Documentation Records for the individual refuges contained in **Appendix B**, separate from this document, especially those related to revegetation efforts, moist soil, and marsh management strategies on each of the refuges.

---

[43]Please refer to Issue #13: Environmental Education and Public Outreach.

ISSUE #2: Endangered Species Management

Goal #2: To achieve threatened and endangered species recovery, and to strengthen the role of the lower Colorado River national wildlife refuges in the recovery of all applicable endangered species, threatened species, all candidate species, and all species of concern to the States of California and Arizona.

Objectives:

(1) Enhance viability and protection of endangered species by establishing minimum water and terrestrial habitat management requirements for each of the threatened and endangered species. **Target: Develop strategies to include (a) effecting changes to Colorado River water releases that will not interfere with threatened and endangered species habitats, and (b) develop interagency cooperative habitat enhancement and protection activities on and off the refuges. [Years 1-5]**

(2) Enhance protection of critical habitat for all refuge and Area of Ecological Concern endangered species by establishing water quality monitoring standards in cooperation with California, Nevada, and Arizona environmental regulators.[44] **Target: Development of standards. [Year 1-4]**

(3) Improve endangered species long-term viability by implementing special project and protection strategies detailed in **Appendix A** (attached to this document) and Objective Documentation Records for the individual refuges contained in **Appendix B** (separate from this document) especially those related to revegetation efforts on each of the refuges, moist soil and marsh management strategies, and those related to the enhanced protection of endangered species habitats.

(4) Improve interjurisdictional and organizational knowledge and understanding of endangered species by developing a formal process of information sharing among agencies relative to threatened and endangered species. **Target: The Refuges should establish times throughout each year to meet with other agencies to discuss status and continuity of relative efforts to benefit threatened and endangered species. (At least once a year). [Years 1-20]**

(5) Improve intraorganizational knowledge and understanding of Area of Ecological Concern and refuge endangered species by establishing a formalized inter-refuge information transfer program to improve management, research, and the dissemination of information to the public and the scientific community. **Target: 1 special inter-refuge work detail per year. [Years 1-20]**

(6) Improve protection of sensitive habitat areas by developing public use zoning options for presentation to other jurisdictions in the Area of Ecological Concern. This effort should lead to a coordinated recreational use standard that will benefit endangered and other species on and off the national wildlife refuges.[45] **[Year 1]**

---

[44]Please refer to Issue #8 Revegetation.

[45]Please refer to Issue #10 Compatibility and Refuge Allowable Uses

ISSUE #3: Fisheries Enhancement and Management

Goal #3: In cooperation with the Service Fisheries Resource Office, and other state and federal agencies with joint jurisdiction to restore, enhance and protect fish ecosystems on the lower Colorado River Refuges.

Objectives:

(1) Determine specific scientific research data needs (related to aquatic ecosystems) for each of the lower Colorado River national wildlife refuges, produce an inventory of those specific needs, and develop a coordinated strategy for meeting those needs. The inventory of needs should be prepared in cooperation with other resource management agencies and institutions of higher learning and research. Strategies should result in increased cooperative research through institutions or enhancement of refuge biological staffs. **[Year 2]**

(2) Enhance protection of aquatic habitat for all refuge and Area of Ecological Concern fish species by establishing water quality monitoring standards in cooperation with California, Nevada, and Arizona state environmental regulators. **[Year 4]**

(3) Achieve higher levels of scientific information consistency by developing and strengthening cooperative efforts between the refuges, the Fishery Resource Office (Parker), the AGFD, CDFG, and other Area of Ecological Concern jurisdictions (including Native American governments and private landowners). **[Year 2]**

(4) Improve interjurisdictional and organizational knowledge and understanding of endangered fish by developing cooperative special habitat goals and objectives for the benefit of endangered, threatened aquatic species, or species of concern to the respective States. **[Years 1-10]**

(5) Improve protection of sensitive fish habitat areas by developing public use zoning options in the entire Area of Ecological Concern. This effort should lead to a coordinated interagency recreational use standard that will benefit endangered and other fish species on and off the national wildlife refuges. **[Year 1]**

(6) Increase awareness of the key nature of fish and aquatic values to overall biological diversity by developing new and strengthening existing educational and interpretive programs that emphasize aquatic and fishery resources along the River. **Target: Develop complex-wide resource interpretive strategies. [Year 3]**

(7) Improve visitor contact and administrative facilities for the Bill Williams River NWR-Parker Fishery Resource Office. **[Year 2]**

ISSUE #4: Migratory Waterfowl Management

Goal #4: To improve ongoing refuge management programs that enhance migratory waterfowl populations and health on each of the four River refuges and other jurisdictions within the Area of Ecological Concern.

Objectives:

(1) The refuges will achieve optimum levels of vegetation mixes, protect water resources, and still provide for refuge waterfowl management for the next 10 years by:

(a) Holding farm management acreage at 1993 levels at Havasu NWR since migratory bird populations clearly appear to be generally stable with a slight upward trend, and no adjacent farm depredation of any significance occurs or is projected to occur. **(Havasu NWR Objective) [Years 1-10]**

(b) Increasing (from 1993 levels) moist soil management acreage at Havasu NWR in the Pintail Slough Moist Soil Subunit and enter into a cooperative agreement with the BLM to employ moist soil management in BLM Section 29, which is adjacent to the refuge. **(Havasu NWR Objective) [Years 1-10]**

(c) Establishing a water quality monitoring standard at Havasu NWR, Topock Marsh Management Unit. **(Havasu NWR Objective) [Year 3]**

(d) Continue policy of not farming lands on Bill Williams River NWR because of threats of extensive groundwater pumping to the deep water aquifer. If the Planet Ranch is acquired by the Service or if management is delegated to the Service, limit farming activities on the Planet Ranch to a minimum of 300 to 500 acres for use as goose browse.[46] **(Bill Williams River NWR Objective) [Years 1-20]**

(e) In cooperation with the AGFD, monitoring adjacent farm depredation at Cibola NWR more closely and improving public outreach efforts to include the surrounding farming community. Strategies could include individual meetings, group meetings, open houses, and newsletters. **(Cibola NWR Objective) [Years 1-20]**

(f) Holding crop acreage at Cibola NWR at the 1993 level until water rights questions are addressed for the California side of the Refuge or until additional lands can be acquired to expand crops and moist soil management. (i.e., Cibola Valley Irrigation District lands). **(Cibola NWR Objective) [Years 1-5]**

(g) Continuing moist soil management activities at Cibola NWR, and with the appropriate water management improvements expanding moist soil management acreage in the Island Management Unit. **(Cibola NWR Objective) [Years 1-10]**

---

[46]The Service does not rule out pumping of surface or groundwater at limited levels for the purpose of restoration of vegetation in a manner which does not affect other riparian resources. Once the relationship between surface flows and groundwater elevations on the Bill Williams River are understood through monitoring, there may be circumstances during which minor amounts of pumping can occur with no impact anticipated.

(h) Holding Imperial NWR farm management acreage at the 1993 levels but making substantial improvements to the irrigation systems.[47] **(Imperial NWR Objective) [Years 1-10]**

(i) Expanding moist soil management acreage as much as possible at Imperial NWR in the Martinez Lake and Riverbank Management Unit. **(Imperial NWR Objective) [Years 1-5]**

(j) Monitoring migratory bird and waterfowl interchange between Cibola and Imperial NWRs, and make appropriate adjustments to management practices which will address migratory bird needs. **(Cibola & Imperial NWRs' Objective) [Years 1-20]**

(k) Acquiring Cibola Valley Irrigation District lands as part of the Cibola NWR as outlined in **Appendix A** attached to this plan, and any future lands which become available that can contribute to the conservation of wildlife diversity, including the acquisition of inholdings within any of the refuge boundaries. **(Cibola NWR Objective) [Year 3]**

(2) The Refuges will establish consistency in migratory bird and waterfowl management in the Area of Ecological Concern in association with other agencies and Native American governments including cooperative planning with tribes, the State of Arizona, and the State of California. **Target: Annual meetings (similar to those held in the Middle Rio Grande Valley in New Mexico) with other interested agencies. [Years 1-20]**

(3) Improve migratory waterfowl hunter opportunity throughout the Area of Ecological Concern by developing coordinated and integrated refuges waterfowl hunt management strategies with the appropriate amount of public involvement and in coordination with AGFD. **[Year 2]**

(4) Improve interorganizational understandings of migratory waterfowl use of the lower Colorado River basin by developing working agreements with the Colorado River Indian Tribe relative to waterfowl management and hunt programs affecting both jurisdictions. **[Year 5]**

(5) Develop an interjurisdictional migratory waterfowl database to better understand the relationship between migratory waterfowl and other species within the lower Colorado River refuges, the Area of Ecological Concern to the Pacific Flyway. **[Year 5]**

(6) Improve habitat for all migratory birds by implementing special project and protection strategies in **Appendix A** (attached to this document) and Objective Documentation Records for the individual refuges contained in **Appendix B**, separate from this document, especially those related to farming, moist soil, and marsh management strategies.

ISSUE #5: Wetlands

Goal #5: To achieve protection and enhancement of existing wetland areas on the four river refuges and rehabilitation of former wetlands where possible.

Objectives:

(1) Enhance existing wetlands and rehabilitate former wetlands by implementing special project and protection strategies detailed in **Appendix A** (attached to this document) and Objective

[47]Please refer to Issue #7 Water Management.

Documentation Records for the individual refuges contained in **Appendix B** (separate from this document) especially those related to reconstitution of former wetlands, moist soil, and marsh management strategies.

(2) Improve consistency in wetland protection efforts by strengthening interagency relationships with the BR, the Army Corps of Engineers, and other Federal and state agencies; and by coordinating an informal wetlands assessment within of the Area of Ecological Concern relative to the existing National Wetlands Inventory database. **Target: Coordinate with appropriate agencies wetlands conservation efforts including backwater restoration projects, impoundments for endangered fish recovery, and development of water resource delivery systems to marsh and lake areas. [Year 1-20]**

(3) Improve opportunities for wetland enhancement by maximizing fiscal, staff, and equipment resource sharing opportunities between the state and Federal levels, related to wetlands protection. **Target: Develop and implement list of resource sharing opportunities for wetlands protection and restoration. [Years 1-20]**

(4) Improve wetland protection efforts by acquiring additional lands with wetland values and the requisite water rights. **Targets: Bill Williams NWR management should consider Planet Ranch joint management or acquisition for protection of Bill Williams River NWR riparian values; Cibola NWR should consider acquisition and management (including necessary water rights) of farm lands north of Cibola NWR in Arizona.[48] [Years 1-10]**

(5) Enhance existing refuge wetlands by rehabilitating the former wetlands on Cibola NWR (e.g., Three Fingers Lake); backwater lake and marsh enhancement at Imperial NWR, improvements to the Topock Marsh Management Unit of Havasu NWR; and improvements to riparian habitat at Bill Williams River NWR.[49] **[Year 5]**

ISSUE #6: Water Rights

Goal #6: In cooperation with the BR and the lower basin states, to enhance use of Colorado River water by the refuges and, protect existing Refuge water rights holdings in the Area of Ecological Concern, and obtain additional rights when possible without adversely affecting other entitlement holders in the lower basin states.

Objectives:

(1) Maximize present water rights by researching the opportunities to "pool" existing water right allotments on the separate lower Colorado River national wildlife refuges (especially between Cibola NWR and Imperial NWR which are contiguous), and investigating opportunities for acquisition of water rights or other mechanisms for management of water on refuge lands on the California side of the River. **[Years 1-3]**

[48]Please refer to Issue #11 Land Status and Jurisdiction, Objective (6).

[49]Please refer to Issue #7 Water Management.

(2) Improve water rights holdings by researching, and listing in priority available parcels of land with water rights near each of the lower Colorado River national wildlife refuges for possible acquisition. **[Year 2]**

(3) Improve interagency understandings of the Service's Colorado River water right entitlements, regulations impacting the use of water, and the Law of the River. These understandings can be improved by working with the BR; lower basin states of Arizona, California, and Nevada; and the various Colorado River Native American governments. **Target: Agreement between the Service and the BR to address the management of the Service's Colorado River water entitlements and annual meetings to track progress.**[50]

(4) Improve water use efficiencies by acquisition of the appropriate instream flow and nonconsumptive flow capabilities in cooperation with the BR and California and Arizona state authorities. **[Year 3]**

(5) Improve protection of water resources within the Area of Ecological Concern by monitoring water right transfer and acquisition issues on land areas in the proximity of the national wildlife refuges and recommend action to protect wildlife and habitat resources. **Target: Develop water use information data base in cooperation with BR, States, and local irrigation districts and associations. [Years 1-10]**

ISSUE #7: Water Management

Goal #7: In cooperation with the BR and the Army Corps of Engineers, improve the efficiency of water delivery systems and more effectively gauge water use for the ultimate benefit and enhancements to habitat and wildlife.

Objectives:

(1) Improve understandings of water resources and dynamics by implementing and completing hydrological inventories and full analytical studies where necessary for Havasu, Bill Williams River, Cibola, and Imperial NWRs. **[Year 2]**

(2) Improve water use efficiencies by:

(a) Refurbishing the Havasu NWR Topock Marsh Inlet Canal hydrology and gauging. **(Havasu NWR Objective) [Years 1-3]**

(b) Constructing appropriate water level control mechanisms (i.e., dikes and new inlet and drainage structures) in the Topock Marsh Management Unit. **(Havasu NWR Objective) [Years 1-3]**

[50] The Service and the BR believe that in order for the refuges to be able to optimize their use of Colorado River water, the following actions need to be considered: (1) The Service should explore with the BR various possibilities for using the current entitlements and options for nonconsumptive uses; (2) The BR could assist in the development of a modeling study of projected and actual consumptive use of river water based on the Lower Colorado River Accounting System; (3) The BR could also assist with vegetation management studies, local groundwater hydrology studies, and design of required metering systems; and (4) The BR could assist in the development of water conservation plans relating to the operations on the refuges.

(c) Refurbishing Cibola NWR ditches and water delivery canals in the Island Management Unit. **(Cibola NWR Objective) [Years 1-5]**

(d) Rehabilitating Cibola NWR pumps in the Hart Mine and Cibola Lake Management Units or other alternatives resulting in the improvement of water diversion and delivery to the two units. **(Cibola NWR Objective) [Years 1-5]**

(e) Redesigning and constructing improvements to the water delivery system for cropland and moist soil management and revegetation activities in the Martinez Lake and Riverbank Management Unit of Imperial NWR. **(Imperial NWR Objective) [Years 1-5]**

(3) Improve water use efficiency by acquiring instream flow rights or nonconsumptive flow through capability for each of the refuges. **[Years 1-5]**

(4) Improve understanding of current water use efficiencies by acquiring and installing the appropriate water gauging equipment for each of the lower Colorado River national wildlife refuges. **[Years 1-3]**

(5) Identify areas on the refuges that are not conducive to revegetation with cottonwood/willow, but conducive to revegetation with other native riparian plants with less consumptive water demand in order to assist the BR to effect a savings in water. (Revegetation targets above those outlined in this plan will be set in coordination with BR.) Under the BR plan, the Bill Williams River area is not part of their water use efficiency and revegetation project since Bill Williams River water is not included in the lower Colorado River allotment. The Bill Williams River NWR will continue to plan revegetation of all salt cedar areas with cottonwood/willow, wherever feasible.[51] **[Years 1-20]**

ISSUE #8: Revegetation

Goal #8: In cooperation with the BR, revegetate substantial amounts of habitat with native mixes of vegetation leading to biological diversity.

Objectives:

(1) Identify areas conducive to salt cedar removal and revegetation with native cottonwoods and willows and other native plants to improve habitat for native resident and migrating avian species. **Targets: Annual revegetation of 50 acres per year, per refuge leading to a cumulative annual of 200 acres per year. (4,000 acres by year 20 of this plan.) [Years 1-20]**

(2) Maximize efficiency of revegetation among the lower Colorado River refuges by implementing special project and protection strategies detailed in **Appendix A** (attached to this document) and Objective Documentation Records for the individual refuges contained in **Appendix B** (separate from this document) especially those related to revegetation, moist soil, and marsh management strategies.

[51]Please refer to Issue #8: Revegetation.

(3) Improve consistency in revegetation of the refuges by providing the BR with assistance and cooperation toward the accomplishment of targets detailed in the BR's 20-year Vegetation Management Study.[52] **[Years 1-20]**

(4) Identify areas on the refuges that are not conducive to revegetation with cottonwood/willow, but conducive to revegetation with other native riparian plants with less consumptive water demand in order to assist the BR to effect a savings in water. (Revegetation targets above those outlined in this plan will be set in coordination with BR.) Under the BR plan, the Bill Williams River area is not part of their water use efficiency and revegetation project since Bill Williams River water is not included in the lower Colorado River allotment. The Bill Williams River NWR will continue to plan revegetation of all salt cedar areas with cottonwood/willow, wherever feasible. **[Years 1-20]**

ISSUE #9: Water Quality and Contaminants

Goal #9: To improve overall refuge water quality and protect refuge waters from all contamination.

Objectives:

(1) Improve understanding of effects of selenium contamination on species by funding, solely or in cooperation with universities or research institutes, follow-up research. **[Year 3]**

(2) More consistently implement State and Federal water quality standards by strengthening dialogue with the water quality officials from both Arizona and California, **Target: Develop a joint agency river-wide water quality information base.] [Year 1-5]**

(3) Enhance river-wide and refuge contaminant protection efforts improving emergency preparedness for possible disaster response efforts (i.e., oil spills, hazardous waste spills on the Colorado River) in cooperation with other government agencies. **[Years 1-5]**

(4) Improve understanding of effects of human use and wastes on Area of Ecological Concern and refuge water quality by monitoring public uses, concentrations, and effects on water, land, and wildlife resources. **Target: Develop a monitoring program. [Year 5]**

[52]PART I, Unit 2, Section 6F of the CMP document outlines the BR's *Vegetation Management Study* and the associated goals and objectives. Also please refer to Summary Tables For Refuge Biological Resource Suitability on page 64 for projected increase in acreage suitability by refuge and species type.

ISSUE #10: Compatibility and Refuge Allowable Uses

Goal #10: To ensure that only compatible and appropriate activities occur on the lower Colorado River national wildlife refuges, and to regulate, as provided by law, all activities, uses, and practices on and off the refuges that are potentially harmful to refuge resources.

Objectives:

(1) Identify and describe the various jurisdictions' recreational land and water uses including refuge and non-refuge areas along the Area of Ecological Concern. **Target: Produce a jurisdictional and land and water use orientation map in cooperation with the BR and other agencies. [Year 2]**

(2) Ensure the primacy of wildlife resource protection by performing annual compatibility analyses on all activities at each of the national wildlife refuges and submit a report to the Regional Office.[53] **[Years 1-20]**

(3) Ensure clear application of compatibility by first resolving jurisdictional questions as detailed in **GOAL #11: Land Status and Jurisdiction** objectives. **[Year 3]**

(4) Maximize public appreciation for the special role of the Service in managing natural resources and the Service's unique responsibility in protecting wildlife by developing joint-jurisdictional public use opportunity information as detailed in **GOAL #13: Environmental Education and Public Outreach. Target: A joint-jurisdictional public use opportunity brochure. [Year 3]**

(5) Reduce levels of nonwildlife-oriented recreation on national wildlife refuges by strengthening enforcement and educational outreach efforts. Recreational activity target levels as detailed in Objective Documentation Records for the individual refuges contained in **Appendix B** (separate from this document). Also refer to **GOAL #13** and **GOAL #14** in this Section.

(6) At a reasonable time prior to the expiration of any permits or lease agreements on refuge lands, the managers will determine the compatibility of current uses and consider the options of not renewing upon expiration, renewal, or changes in the scope and intensity of use(s). For example, the 20 year lease at Five Mile Landing will expire in the year 2006. The refuge manager (Havasu NWR) will make a determination of the current use's compatibility in its current scope, and propose options no later than 10 years prior to lease expiration (i.e., 1996). This will give the lease owners enough notice and time to prepare accordingly.[54] **[Years 1-20]**

(7) Any leasehold or formally permitted activity will be monitored annually to ensure activities are within the scope specified on the permit or lease agreement. Any breach of provisions of leases or permits will be dealt with consistently and quickly. **[Years 1-20]**

---

[53]Please refer to pages 103 and 104 for a list of Secondary uses planned to occur and uses not planned to occur on the 4 refuges.

[54]Please see page 13 for description of Five Mile Landing lease at Havasu NWR and refer to Issue 311 Land Status and Jurisdiction, Objective (7).

Goal #11: Land Status and Jurisdiction

Goal #11: To clarify each of the Colorado River refuges' jurisdictional authorities as they relate to any concurrent or related authorities vested in other Federal, state, local and Native American governments with natural resource interests within the Area of Ecological Concern; to ensure refuge boundary integrity relative to adjacent lands; and when the opportunities, funding, and rationale are present, to acquire additional lands to further protect fish and wildlife resources.

Objectives:

(1) Improve understanding of jurisdiction and authorities by researching chain-of-title and evidence of ownership documents for each of the National Wildlife Refuge system lands along the lower Colorado River. **Target: In cooperation with BR, develop a single point location of refuge and adjacent lands title and conveyance documents. [Year 2]**

(2) Improve jurisdictional standing by perfecting evidence of title for each refuge parcel where necessary. **[Year 5]**

(3) Improve understanding of authorities and proprietary rights of other jurisdictions in the Area of Ecological Concern by identifying and describing the fundamental agency and jurisdictional differences between refuge and non-refuge lands and waters. **Targets: (a) Conduct an interagency review of concurrent jurisdictional authorities, particularly those authorities that relate to the enforcement on navigable waters. This review could result in appropriate memoranda of understanding clarifying these concurrent roles. (b) Produce a jurisdictional map by year two of this plan based upon multiagency mutual understanding.**[55] **[Year 5]**

(4) Improve understanding of potential land status and jurisdictional conflicts in the Area of Ecological Concern by improving interagency communication and public outreach. **Target: Develop a land status conflict resolution strategy. [Year 2]**

(5) Improve understanding of authorities to regulate recreational activities on navigable waters adjacent to the four refuges, where such activities impact on refuge resources and refuge purposes. **Targets: Develop cooperative enforcement strategies along with State regulatory authorities relative to public uses on navigable waters. [Year 1]**

(6) Pursue opportunities to acquire Cibola Valley Irrigation District lands to add to the Cibola NWR (as detailed in **Appendix A** attached to this plan) and any future lands which become available that can contribute to the conservation of wildlife diversity including the acquisition of inholdings within any of the refuge boundaries. **[Year 3]**

(7) As the 20-year lease at Five Mile Landing (Havasu NWR) will expire in the year 2006, the refuge manager (Havasu NWR) will make a determination of the current use's compatibility in its current scope, and propose options no later than 10 years prior to lease expiration (i.e., 1996). This will give the lease owners enough notice and time to prepare accordingly.[56] **[Years 1-20]**

---

[55]Please refer to Issue #10 Compatibility and Refuge Allowable Uses.

[56]Please see page 13 for description of Five Mile Landing lease at Havasu NWR.

ISSUE #12: Nonwildlife-Oriented Recreation and Law Enforcement

Goal #12: To reduce levels of nonwildlife oriented recreation on the River channel that runs through the lower Colorado River refuges, eliminate all nonwildlife-oriented recreation that is not *compatible*, increase the quality experience related to natural values by all River visitors, and raise public awareness of the lower Colorado River ecosystem values.

Objectives:

(1) Reduce nonwildlife-oriented recreation on the River channel that passes through the refuges by consistent enforcement where jurisdiction applies, and through joint-jurisdictional educational efforts. Enforcement will be coordinated with both States' wildlife agencies in consideration of applicable uniform waterway navigation regulations. **Target: Five percent per year reduction throughout the 20-year planning cycle.**

(2) Protect wildlife resources by implementing the appropriate zoning policy for sensitive areas of the refuges, especially those pertaining to endangered species. Each refuge manager will review existing refuge zoning regulations and implement zones that take into account refuge purposes and the proximity to other jurisdictions that are more conducive to the nonwildlife-oriented uses (i.e., water skiing, jet skiing areas).[57] **[Years 1-3]**

(3) Improve educational efforts regarding the unique role of the Service in protecting wildlife resources by coordinating a joint-jurisdictional information and education booklet informing the public of recreational use opportunities River-wide and sensitive habitat areas on the refuges. Investigate and develop River-wide joint-jurisdictional public use opportunity information. (Also see **GOAL #10**). **Target: A joint-jurisdictional public use opportunity brochure. [Year 3]**

(4) Improve law enforcement coordination in cooperation with California and Arizona fish and game officials by developing a River-wide joint-jurisdictional law enforcement strategy that will include the law enforcement officials from all jurisdictions along the lower Colorado River; and increase refuge law enforcement staffing along the River to include new collateral, seasonal, and full-time law enforcement officers, as funding will allow. **[Year 5]**

ISSUE #13: Environmental Education and Public Outreach

Goal #13: To establish a formal program for public outreach, identify important public resources, and improve educational and interpretive programs for refuge habitat, wildlife, and cultural resources.

Objectives:

(1) Improve public appreciation of wildlife resources and awareness of ecological values by developing an environmental education and public outreach strategy. This strategy would detail the role of each of the four lower Colorado River national wildlife refuges in each of the local communities. **[Year 5]**

---

[57]Please refer to Issue #10 Compatibility and Refuge Allowable Uses

(2) Improve outreach to children and schools by designing an environmental education and interpretation program tailored to fit the needs of the local schools from elementary grades through secondary levels. **[Year 5]**

(3) Enhance the public's experience of the role of the lower Colorado River refuges by pursuing development of a Lower Colorado River National Wildlife Refuges Resource Interpretation Center in Yuma, Arizona. **[Year 1-10]**

(4) Improve on refuge interpretive programs by developing on-refuge interpretive programs (including displays, and exhibits) for Havasu, Bill Williams River, Cibola, and Imperial NWR's. (See Objective #9 below). **[Year 1-5]**

(5) Consider, with more detailed public use planning, enhancement of the public's appreciation for the ecological region by designing a set of auto tour options including: Havasu, Bill Williams River, Cibola, Imperial, and Kofa NWRs. **Target: Site- development plan for self interpretive auto tour route options.**[58] **[Year 3]**

(6) Improve Service understanding of public use of the Area of Ecological Concern by establishing a public use information database. **Target: Develop Public Use Management strategies. [Year 2]**

(7) Improve local business' understanding of wildlife and ecological values. Encourage business participation in the protection and enhancement of the Area of Ecological Concern resources. This will be done by developing joint interpretation and education programs with private sector companies and manufacturers of sporting equipment and will take advantage of any possible financial resource opportunities. **[Year 5]**

(8) Improve refuge relationships with local communities by establishing a "Friends of the Colorado River Refuges" support organization. **[Year 1]**

(9) Improve lobby interpretive area at Imperial and Cibola NWRs. Build new visitor contact areas and/or visitor centers at both Havasu, and Bill Williams River NWRs. **[Year 1-5]**

ISSUE #14: Refuge Wildlife Recreation Management

Goal #14: To achieve optimum levels of wildlife observation, fishing, and hunting recreation opportunities where such use is legally *compatible* with the purposes of the refuges and the goals of the National Wildlife Refuge System.

Objectives:

(1) Facilitate salient and consistent interpretive theme development for the lower Colorado River refuges by developing site-specific public use strategies for those uses determined to be compatible with refuge purposes. Projected public use levels for fishing, hunting, and wildlife observation will

[58]As noted earlier in the document, site-specific discussions related to public use improvements are subject to the development of more detailed public use management strategies. Discussions of specific projects are intended to prompt consideration of these options and form the basis for alternative development for a more detailed plan. These projects should only be considered conceptual at this stage. Any future site-specific proposals would be subject to additional NEPA consideration.

remain between the ranges indicated in Objective Documentation Records for the individual refuges contained in **Appendix B** (separate from this document). **[Year 3]**

(2) Ensure reasonable levels of hunting and fishing opportunities that do not place harmful pressure on the species populations and sensitive habitat areas and that do not conflict with wildlife management strategies or other forms of allowable wildlife-oriented recreation. **Target: Develop an updated refuge hunting and fishing management plan for each refuge, and develop site-specific public use strategies on each refuge for uses determined to be compatible with refuge purposes. [Year 3]**

(3) Effect improved coordination in the dissemination of information and improvement in communication with local and statewide hunting and fishing organizations. **Target: Meet with representatives from these groups annually. [Years 1-20]**

(4) Effect improved coordination in the dissemination of information and improvement in communication with local and statewide conservation organizations. **Target: Meet with representatives from these groups annually. [Years 1-20]**

(5) Consider, with more detailed public use strategy development, improvements to existing auto tour routes at Cibola NWR including interpretive materials, kiosks, observation towers, and appropriate signage. **[Year 3]**

(6) Consider, with more detailed public use strategy development, the improvement of wildlife observation opportunities at Havasu, Bill Williams River, and Imperial NWRs by adding an auto tour route with appropriate interpretive materials and signage in an appropriate location. **[Year 3]**

(7) Consider, with more detailed public use strategy development, improvements to wildlife observation opportunities at Havasu, Bill Williams River, Cibola, and Imperial NWRs by constructing and/or improving existing wildlife hiking trails to include appropriate interpretive materials and signage.[59] **[Year 5]**

(8) Consider, with more detailed public use strategy development, improvements to wildlife observation at Imperial NWR by improving road access from main Yuma County, Martinez Lake Village Road to Imperial NWR Refuge Visitor Center and Headquarters through joint County/Service cost-share agreement. **[Years 5-10] plan.**

[59]Although interpretive foot trails already exist at Imperial NWR, opportunities exist to construct new interpretive hiking trails and increase wildlife observation on the Refuge.

ISSUE #15: Area of Ecological Concern Interagency Coordination

Goal #15: To strengthen interagency and jurisdictional coordination of lower Colorado River issues, resulting in decisions benefiting fish and wildlife resources, while avoiding duplication of effort.

Objectives:

(1) Improve inter-refuge management efficiencies by completing the reorganization of the lower Colorado River national wildlife refuges to form a Lower Colorado River National Wildlife Refuges Complex consisting of: Havasu, Bill Williams River, Cibola, and Imperial NWRs.[60] **[Years 1-5]**

(2) Improve local refuge coordination by completing staffing for each refuge and for the Refuge Complex. **[Year 3]**

(3) Improve interagency coordination, planning, communication, and decision-making by meeting with the appropriate Federal agency representatives at least twice annually to discuss coordination efforts on an array of issues including: water management, revegetation, human waste and contaminants, fire management, public recreational use, environmental education and interpretation, and law enforcement.

(4) Improve interagency coordination, planning, communication, and decision-making by participating with the Colorado River Interior Management Group in the development of a long range strategic plan for the Colorado River. The strategic plan will consider development of coordinated efforts relative to environmental, recreational, and water management issues. **[Year 2]**

ISSUE #16: Refuge Relationship to Native American Governments

Goal #16: To strengthen Service working relationships with the various Native American governments situated along the lower Colorado River, resulting in decisions that benefit fish and wildlife resources.

Objectives:

(1) Strengthen tribal-Service relationship by setting the groundwork for ongoing dialogue between the Service Regional policy officials and the respective tribal leadership representatives. **Target: Annual meetings with tribal policy officials. [Years 1-20]**

(2) Strengthen tribal-refuge relationship by establishing bi-annual working meetings with Native American government executive staff in preparation for annual meetings between Service Regional policymakers and Native American government policymakers. **[Year 2]**

(3) Improve understanding and increase sensitivity toward cultural practices by preparing an inventory of Native American cultural practices on the four national wildlife refuges, in coordination with the Native American governments. **[Year 1]**

[60]Please refer to PART II, Unit 1, Section 11 of the CMP document for a general organizational representation of the proposal.

(4) Improve communication with Native American wildlife program leaders by developing a database relating to areas of resource protection priority/concern on Service lands for which the five Native American governments might render advice, expertise, and assistance. **Target: Coordinated database. [Year 1]**

(5) Improve communication with Native American wildlife management leaders by developing in coordination with tribal officials a database relating to areas of natural resource protection priority/concern on tribal lands for which the Service might render advice, expertise, and assistance. These discussions should lead to cooperative efforts in the restoration, preservation, and management of wildlife populations and habitat. **Target: Coordinated database. [Year 2]**

ISSUE #17: Staffing, Funding, and Organizational Structure

Goal #17: To effect improvements to funding and staffing that will result in long lasting enhancements to habitat and wildlife resources in the Area of Ecological Concern and the lower Colorado River national wildlife refuges, leading to the achievement of the goals of this plan and the goals of the National Wildlife Refuge System.

Objectives:

(1) Improve inter-refuge coordination of programs by completing the reorganization of the lower Colorado River national wildlife refuges to form a Lower Colorado River National Wildlife Refuges Complex consisting of: Havasu, Bill Williams River, Cibola, and Imperial NWRs. **[Years 1-5]**

(2) Improve on-refuge program management by completing staffing plan for each refuge and for the Refuge Complex.[61] **[Year 3].**

(3) Improve consistency of management of refuge programs by annually assessing individual program funding needs, prioritizing them, and preparing a budget supported by the goals and objectives of this plan. **[Years 1-20]**

(4) Make management of refuge programs more consistent with Regional management priorities by promoting existing, continuing, and proposed refuge and Service programs in the Area of Ecological Concern, monitoring Work Activity Guidance progress, conducting compatibility reviews with refuge managers, and preparing annual narratives of refuge accomplishments. **[Years 1-20]**

(5) Ensure Comprehensive Management Plan applicability and flexibility for future years by reviewing the document for currency, assessing objective achievement progress, and making suggested amendments to the document in a report to the Regional Director. **Target: Revision of objectives every 5 years. [Years 1-20]**

[61]This objective relates more to the completion (in 3 years) of all necessary administrative staff planning requirements such as Position Descriptions, Grade Levels, and funding sources, and not to the actual filling of the positions as described in Goal 15, Objective 2, which calls for the completion of actual staffing for each refuge and the Refuge Complex by year 6.

SUMMARY TABLES

Refuge Biological Resource Suitability[62]

The following summaries are based on acreage estimates tallied from the various refuge management units and special activity areas. These estimates are intended to give the reader a proportional sense of the level of desired change to refuge habitat through the implementation of long-term management strategies. These estimates are not the objectives in and of themselves. Degrees of positive change to the habitat and wildlife are desired outcomes rather than objectives.

Current Habitat Suitability -- The *Current Suitability* category is comprised of the cumulative estimates of acreage that currently serve various wildlife if even to a minimum. The *Enhancement* category is comprised of the cumulative acreage targeted for improvement. Some acres in this category are in addition to those currently suitable for a particular use; these acres are noted as "additional." In the *Enhancement* category, those that are not noted as "additional" are already suitable but are yet in need of some improvement.

Future Habitat Suitability -- The last matrix is comprised of the cumulative estimated acreage for each of the main species groups. Endangered species are listed individually. The *Future Suitability* category is comprised of the combination of currently suitable acres and additional acreage proposed for improvement.

The acreages represented in this summary are the priority areas of the refuges based upon management unit/subunit and special activity area inventories.

Lower Colorado River National Wildlife Refuge Goals

There are 17 goals for the lower Colorado River national wildlife refuges corresponding to the major issues that have surfaced as a result of the planning process. These goals are applicable to each of the refuges. Each refuge goal has a series of objectives leading to the achievement of the goal. Many of the objectives apply to all of the refuges; however, there are a few related directly to one or two of the refuges.

---

[62]The term "suitable" is not intended to represent qualitative aspects of the habitats deemed to be supportive of certain types of species. Each of the species outlined in the tables has basic habitat needs and preferences. Based upon the refuge managers' experiential sense of wildlife use within various habitats on the refuges, acreage was estimated. The numbers represented in the tables are certainly not exclusive of other refuge habitats which support the respective species in some way. Suitable acreage is understood in its broadest sense as acreage preferred by a particular species and where wildlife is observed to feed, breed, or roost.

Biological Resource Suitability Acreage Summary

Havasu National Wildlife Refuge
Present Wildlife Suitability Acreage, and Acreage Targeted For Enhancement

Species	Acres Suitable - current estimate	Acreage Proposed for Enhancement
Southern Bald Eagle (endangered)	14,882	2,013 (additional)
Peregrine Falcon (endangered)	14,882	2,013 (additional)
Y. Clapper Rail (endangered)	3,181	521 (additional)
Colorado Squawfish (endangered)	none	none planned
Razorback Sucker (endangered)	none	none planned
Bonytail Chub (endangered)	none	none planned
Migratory, Resident, and Wintering Nongame Avian Species (songbirds and raptors)	14,276	2,013 (additional)
Marsh and Waterbirds	3,181	971 (additional)
Migratory Waterfowl	376	818 (additional)

Bill Williams National Wildlife Refuges
Present Wildlife Suitability Acreage and Acreage Targeted For Enhancement

Species	Acres Suitable - current estimate	Acreage Proposed for Enhancement
Southern Bald Eagle (endangered)	5,500	820
Peregrine Falcon (endangered)	5,500	820
Y. Clapper Rail (endangered)	300	
Colorado Squawfish (endangered)	none	320
Razorback Sucker (endangered)	none	320
Bonytail Chub	none	320
Migratory, Resident, and Wintering Nongame Avian Species (songbirds and raptors)	6,000	820
Marsh and Waterbirds	300	
Migratory waterfowl	500	none planned

Cibola National Wildlife Refuge
Present Wildlife Suitability Acreage and Acreage Targeted For Enhancement

Species	Acres Suitable - current estimate	Acreage Proposed for Enhancement
Southern Bald Eagle (endangered)	2,600	3,850
Peregrine Falcon (endangered)	2,600	3,850
Y. Clapper Rail (endangered)	1,000	1,765
Colorado Squawfish (endangered)	none	465
Bonytail Chub (endangered)	none	465
Razorback Sucker (endangered)	none	465
Migratory, Resident, and Wintering Nongame Avian Species (songbirds and raptors)	2,600	3,850 (additional)
Marsh and Waterbirds	2,400	2,385 (additional)
Migratory Waterfowl	2,700	1,715 (additional)

Imperial National Wildlife Refuge
Present Wildlife Suitability Acreage and Acreage Targeted For Enhancement

Species	Acres Suitable - current estimate	Acreage Proposed for Enhancement
Southern Bald Eagle (endangered)	13,320	3,310
Peregrine Falcon (endangered)	13,320	3,310
Y. Clapper Rail (endangered)	3,690	2,070
Colorado Squawfish (endangered)	none	1,000
Razorback Sucker (endangered)	none	1,000
Bonytail Chub (endangered)	none	1,000
Migratory, Resident, and Wintering Nongame Avian Species (songbirds and raptors)	13,320	2,910
Marsh and Waterbirds	5,000	2,310
Migratory Waterfowl	1,700	400

Twenty-Year Habitat Improvement Targets

Percentage Increase In Suitable Habitat Through Habitat Enhancement Projects
For All Lower Colorado River NWRs

Species	Current Suitability	Future Suitability	% Increase
Southern Bald Eagle (endangered)	36,302	42,165	16%
Peregrine Falcon (endangered)	36,302	42,165	16%
Y. Clapper Rail (endangered)	8,171	10,457	28%
Colorado Squawfish (endangered)	0	1,665	--
Razorback Sucker (endangered)	0	1,665	--
Bonytail Chub (endangered)	0	1,665	--
Migratory, Resident, and Wintering Nongame Avian Species (songbirds and raptors)	36,196	42,665	16%
Marsh and Waterbirds	10,881	14,237	31%
Migratory Waterfowl	6,726	9,229	37%

LOWER COLORADO RIVER NATIONAL WILDLIFE REFUGES COMPREHENSIVE MANAGEMENT PLAN GOALS

1. Biological Diversity and Habitat Management--In cooperation with other resource management agencies, to restore and maintain the natural diversity of the Colorado River Area of Ecological Concern, especially on refuge lands.	7. Water Management--In cooperation with the BR and the Army Corps of Engineers, to improve the efficiency of water delivery systems and more effectively gauge water use for the ultimate benefit and enhancements to habitat and wildlife.	13. Environmental Education and Public Outreach To establish a formal program for public outreach, identify important public resources, and improve educational and interpretive programs for refuge habitat, wildlife, and cultural resources.
2. Endangered Species Management--To achieve threatened and endangered species recovery, and to strengthen the role of the lower Colorado River national wildlife refuges in the recovery of all applicable endangered species, threatened species, candidate species, and species of concern to the States of California and Arizona.	8. Revegetation--In cooperation with the BR, revegetate substantial amounts of refuge habitat with native mixes of vegetation leading to biological diversity.	14. Refuge Wildlife Recreation Management To achieve optimum levels of wildlife observation, fishing, and hunting recreation opportunities where such use is legally *compatible* with the purposes of the refuges and the goals of the National Wildlife Refuge System.
3. Fisheries Enhancement and Management--In cooperation with the Service Fishery Resource Office, and other state and Federal agencies with joint jurisdiction, to restore, enhance, and protect fish ecosystems along the lower Colorado River refuges.	9. Water Quality and Contaminants--To improve overall refuge water quality and protect all refuge waters from all contamination.	15. Area of Ecological Concern Interagency Coordination--To strengthen interagency and jurisdictional coordination of lower Colorado River issues, resulting in decisions benefitting fish and wildlife resources while avoiding duplication of effort.
4. Migratory Waterfowl Management--To improve ongoing refuge management programs that enhance migratory waterfowl populations and health on each of the four River refuges and other jurisdictions within the Area of Ecological Concern.	10. Compatibility and Refuge Allowable Uses--To ensure that only *compatible* and appropriate activities occur on the lower Colorado River national wildlife refuges, and to regulate, as provided by law, all activities, uses, and practices on and off the refuges that are potentially harmful to refuge resources.	16.Refuge Relationship to Native American Governments--To strengthen Service working relationships with various Native American governments situated along the lower Colorado River, resulting in decisions that benefit fish and wildlife resources.
5. Wetlands--To achieve protection and enhancement of existing wetland areas on the four River refuges and rehabilitation of former wetlands where possible.	11. Land Status and Jurisdiction--To clarify each of the Colorado River refuges' jurisdictional authorities as they relate to any concurrent or related authorities vested in other Federal, state, local, and Native American governments with natural resource interests within the Area of Ecological Concern; to ensure refuge boundary integrity relative to adjacent lands; and, when the opportunities, funding, and rationale are present, to acquire additional lands to further protect fish and wildlife resources.	17. Staffing, Funding and Organizational Structure--To effect improvements to funding and staffing which will result in long lasting enhancements to habitat and wildlife resources in the Area of Ecological Concern and the lower Colorado River National wildlife refuges, leading to the achievement of goals of this plan and the goals of the National Wildlife Refuge System.
6. Water Rights--In cooperation with the BR and the lower basin States, to enhance use of Colorado River water by the Refuges, protect existing Refuge water rights holdings in the Area of Ecological Concern, and obtain additional rights when possible without adversely affecting other entitlement holders in the lower basin states.	12. Non-wildlife Oriented Recreation and Law Enforcement--To reduce levels of non wildlife oriented recreation on the River channel that runs through the lower Colorado River refuges, eliminate all non wildlife oriented recreation uses that are not *compatible*, and increase the quality experience related to natural values by all River visitors, and raise public awareness of the lower Colorado River ecosystem values.	

XI. MAPPING, APPENDIX, AND SPECIAL PROJECT/PROTECTION AREAS

Biological Resource and Activity Mapping

Refuge Management Units and Subunits

The vegetation and wildlife inventory information delineated earlier on pages 23 through 28 provided the means to determine the four refuges' capability to satisfy wildlife needs. This information has been delineated on the Refuge Management Unit maps which follow.

The maps show the major management unit and subunit activities. Associated with the maps are summary descriptions of each of the elements (i.e., management units and subunits). The summary describes the acreage, habitat, and wildlife use.

Special Projects and Activities

Special Project Areas on refuges are those targeted for focused enhancement or protection. A map depicting these areas follows along with summary descriptions of each of the map elements. Project Activity Areas are depicted with orange cross-hatching while Protection Activity Areas are marked with green cross hatching.

In addition, the refuge managers of each of the lower Colorado River National Wildlife Refuges have formulated strategies for these special refuge areas. The strategies will facilitate the achievement of the refuges' objectives that are outlined in on page 47 in this document.[63]

[63]A full description of the special project areas and the associated strategies are delineated in this Appendix.

Havasu NWR Management Units/Subunits
MAP 2

1. Topock Marsh Management Unit

MANAGEMENT SUBUNITS/ ACREAGE	HABITAT TYPE	WILDLIFE USE
A. Pintail Slough Cropping (120 acres)	farm, mesquite, salt cedar woodland	waterfowl, marsh, and waterbirds, raptors, passerine
B. Pintail Slough Moist Soil (61 acres)	marsh, cattail, bulrush	waterfowl, marsh, and waterbirds, raptors
C. Yuma Clapper Rail (Topock Marsh) (1,000 acres)	marsh, open water, cattail	Yuma clapper rail, other marsh and waterbirds, fish and aquatics, waterfowl
D. Dredged River (500 acres)	open river channel dry cut, rip-rapped banks	coots, waterbirds, fish and aquatics, waterfowl
E. Inlet Canal (50 acres)(4 linear miles)	open water, unlined ditch, marsh emergent vegetation	waterfowl, marsh, and waterbirds
F. Bermuda Pasture (95 acres)	bermuda grass field	waterfowl browse, migratory bird use including passerines and raptors

2. Topock Gorge Management Unit

MANAGEMENT SUBUNITS/ACREAGE	HABITAT TYPE	WILDLIFE USE
A. Riverine Management (650 acres)	natural river flow, beaches, backwater marshes, island beaches and riparian vegetation, high rock outcroppings	coots, waterbirds, fisheries, marsh birds, Yuma clapper rail, waterfowl
B. Crystal Beach Management (300 acres)	marsh, cattails, beaches	Yuma clapper rails, marsh birds, waterbirds, shorebirds, waterfowl, fisheries and aquatic
C. Wilderness Uplands (14,606 acres)	desert brush, creosote, mesquite, dry washes, salt cedar, some cottonwood and willow in riparian zone	upland mammals, reptiles, passerine, raptors

3. Havasu NWR Special Project Areas/ MAP 3

ACTIVITY AREA (ACREAGE)	HABITAT TYPE/ACTIVITY TYPE	WILDLIFE USE
#1. N.W. Powell Lake (123 acres) Enhancement	marsh/project	marsh birds, waterbirds, waterfowl, Yuma clapper rail
#2. No Name Lake (195 acres) Moist Soil Enhancement	marsh/project	marsh, waterbirds, waterfowl, Yuma clapper rail
#3. North Refuge Revegetation (600 acres)	salt cedar bosque/project	POTENTIAL: passerine, neotropical migrants, raptors
#4. Beal Lake (500 acres) Moist Soil Enhancement	open water/marsh/project	fish, waterfowl, raptors, marsh and waterbirds
#5. Sacramento Wash Athel Forest (145 acres) Revegetation	marsh/athel forest/protection and project	raptors, passerine, marsh birds POTENTIAL: Improved song bird use.
#6. Topock Gorge Backwaters (1,700 acres)	marsh/protection	Yuma clapper rail, other marsh birds, waterbirds, fish, waterfowl

XII. SPECIAL PROJECT AND PROTECTION AREAS

HAVASU NATIONAL WILDLIFE REFUGE
MAP 3
1. Northwest Powell Lake

Location: Topock Marsh Management Unit. Size: Approximately 123 acres

Habitat Description: An emergent vegetation marsh being invaded by salt cedar. Historically the area was the northwest edge of Powell Lake. The area has been cut off from Topock Marsh by the interior dike constructed by the BR. Underground seepage provides some water into the lower portions of the area.

Water: Water supply presently is from seepage and is of low quantity depending on depth of Topock Marsh.

Wildlife Uses: Yuma clapper rails (endangered), common marsh dwelling birds, and mammals including the feral pig.

CMP Goals:[64] (1)(2)(3)(4)(5)(6)(7)(8)(14)(15)

Strategies:
1. Provide water through diversion or pumping to rehabilitate wetland area and reconstitute marsh.
2. Plant cottonwood/willow poles to provide for neotropical bird use.
3. Prescribe burn as necessary for habitat improvement.
4. Construct dike on west side of area if necessary.

2. No Name Lake

Location: Topock Marsh Management Unit Size: 195 acres

Habitat Description: This area has become encroached upon by heavy stands of cattails. The culverts providing water into the lake have become laden with silt on both ends. This area was originally part of Topock Marsh, but was cut off with the construction of the interior dike. Like the Northwest Powell Lake, underground seepage provides some water for the area.

Water: Water supply is primarily from seepage. The quantity depends on the depth of Topock Marsh.

Wildlife Uses: Yuma clapper rails use the area. Common marsh dwelling birds and mammals, including the feral pig and horse, also use the area. In fall and winter the area is used by ducks and geese. There is good potential habitat for bald eagle, Yuma clapper rails, and migratory waterfowl.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(14)(15)

STRATEGIES:
1. Provide water through diversion or pumping to rehabilitate wetland area and reconstitute marsh.
2. Plant cottonwood/willow poles to provide for neotropical bird use.

[64]These CMP Goals represent the 17 issue/goals represented between pages 47 and 62.

3. Prescribe burn as necessary for habitat improvement.
4. Establish moist soil farming and management in portions of area.
5. Dig and enhance wetlands by use of excavator.

3. North Refuge Revegetation

Location: Topock Marsh Management Unit Size: Approximately 600 Acres

Habitat Description: Predominantly monotypical salt cedar, the area was one of the largest cottonwood and willow forests before the infiltration of the exotic salt cedar.

Wildlife Use: There is minimal use by birds and and some feral pigs. The area presents potential for fire because of the dense groves of salt cedar. With good pole plantings, this area can be successfully revegetated. The depth-to-groundwater is sufficient for recovery.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(15)

Strategies:
1. Clear away (eradicate) salt cedar stands.
2. Plant cottonwood/willow poles. Also plant mesquite and atriplex.
3. Pump water from Topock Marsh through drip irrigation to revegetation areas.
4. Control regrowth of salt cedar.
5. Control burn where possible.

4. Beal Lake

Location: Topock Marsh Management Unit

Habitat Description: Open lake with some emergent vegetation. Water can be drawn down. Beal Lake was originally part of the Colorado River lakes, intermittent channels, and oxbow complex. The lake is now within the Refuge with the inlet and outlet structures.

Wildlife Uses: Used occasionally in fall and winter by bald and golden eagles. Not much use by Yuma clapper rail. Waterfowl and marsh birds use other area year round, particularly in the fall and winter. One of the best areas for viewing wintering waterfowl on the Refuge. Areas surrounding the lake are used by a variety of birds and mammals, including feral pigs, and a variety of raptors. Sport fishing occurs in Beal Lake. Primarily channel catfish and largemouth bass are taken; carp are also abundant.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(14)(15)

Strategies:
1. Plant cottonwood and willow poles.
2. Improve water management.
3. Prescribe burn as necessary for habitat improvement.
4. Optimize carp control.
5. Develop wetland/moist soil management complex.

5. Sacramento Wash Athel Forest Rehabilitation (approx. 70 acres)

Location: Topock Marsh Management Unit Size: 145 Acres

Habitat Description: A monotypic athel forest growing in the Sacramento Wash and delta. Historically, native trees grew in this area, but the introduced athel has, over time, displaced native trees.

Water: Water supply in the wash is dependent on rainfall and flash flooding. Water in the delta is subsurface, related to the level of Topock Marsh and the Colorado River.

Wildlife Use: There is some limited Yuma clapper rail use of the area closest to Topock Marsh. Some coyote and bobcat use the area. Numerous species of birds use the area including summer tanagers, Lucy's warbler, yellowthroats, verdins, lesser night hawks, doves, and turkey vultures.

CMP Goals: (1)(2)(8)(14)(15)

Strategies:
1. Remove the number of athel trees by at least 40 percent.
2. Plant honey mesquite, palo verde and screwbean mesquite.
3. Plant cottonwood poles close to the water.
4. Control athel by a combination of prescribed burning, cutting, and herbicide application.

6. Topock Gorge Backwaters

Location: Topock Gorge Management Unit Size: Approximately 1,700 acres adjacent the Colorado River.

Habitat Description: There are hundreds of separate backwater marshes connected to the Colorado River throughout the Topock Gorge to the vicinity of Castle Rock. Historically, the area was the same, except now the water is deeper for longer periods of time. Salt cedar and scattered stands of giant cane have invaded the shores of various locales. Backwater areas have roundstem bulrush and cattails in varying degrees of thickness and have spiny naiad and some potamogeton. Willows grow in some backwater areas.

Wildlife Use: Yuma clapper rails are found throughout the various backwaters. Grebes and egrets on the AGFD threatened lists occur here. Clark's and Western grebes are found throughout these backwaters. Raptors and all marsh dwelling birds and mammals found in this area occur in the backwater areas. Sport fishery is an integral part of this area.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(9)(10)(12)(13)(14)(15)(16)

Strategies:
1. Hire one full-time refuge law enforcement officer.
2. Plant cottonwood/willow poles.
3. Control salt cedar, giant cane.
4. Prescribe burn decadent stands of emergent vegetation.
5. Establish an "adopt-a-reach" program.
6. Establish firm policy on use of jet skis and clarify law enforcement direction.
7. Zone backwater areas as no-wake areas and close to jet ski use.
8. Apply uniform waterway marking standards in cooperation with AGFD.

Bill Williams River NWR
Management Units
MAPS 4 & 5

MANAGEMENT UNITS	HABITAT TYPE	WILDLIFE USE
A. Delta Management Unit (500 acres	lacustrine, open water, some marsh cattails	waterfowl roosting, Yuma clapper rail, other water and marsh birds, raptor, passerine, neotropical migrants
B. Bill Williams Riparian Unit (2,200 acres)	cottonwood and willow, streambed, salt cedar, minor agricultural	waterfowl, passerine, marsh birds, raptor
C. Bill Williams Upland Unit (2,900 acres)	desert upland, creosote, salt cedar mixes, palo verde	small mammals, reptiles, passerine, raptor, big horn sheep

For mapping purposes, those areas designated for special protection and project activities are primarily the last remaining native vegetation communities along the Bill Williams River. These areas are targeted for enhanced protection and in some cases revegetation with native cottonwood and willow trees.

The Bill Williams River NWR is viewed as an area in need of extensive protection efforts. Continuing encroachment of salt cedar and losses of native cottonwoods and willows are the chief problems the refuge faces for the next 20 years. Of the approximately 2,200 refuge acres of riparian habitat, less than 50 percent is considered to be cottonwood and willow stands. Of that 50 percent of communities designated cottonwood/willow, only 10 percent is actually cottonwood and willow forest. The remainder consists of honey mesquite/salt cedar mixes. In 1986, the percentage of cottonwood and willow habitat was approximately 57 percent.[65] Revegetation efforts between 1987 and 1990 have been moderately successful. As indicated earlier in this document, U.S. Soil Conservation Service experts placed the loss of cottonwoods less than 4 years of age during the summer of 1989 as high as 85 percent. Additional research is expected to improve revegetation efficiencies at the Bill Williams River NWR and on the other lower Colorado River refuges.

If the Planet Ranch (8,389 acres) were acquired or jointly managed, the carrying capacity of the Bill Williams River NWR would increase by more than 100 percent for passerine, neotropical migrants, raptor, and waterfowl species. The Planet Ranch would be an area targeted to possibly serve as a revegetation tree nursery for the Area of Ecological Concern.

[65]Younker, Gordon L., and Chris W. Andersen, *Methods and Vegetation Changes Along the Lower Colorado River Between Davis Dam and the Border with Mexico*, 1986.

SPECIAL PROJECT AND PROTECTION AREAS:
BILL WILLIAMS RIVER NWR
MAP 5

Size. 6,105 acres.[66] Ownership. The area is owned by the Service.

Habitat description. The site can be described as the large remaining single tract of riparian vegetation on lower Colorado River. The site consists of approximately 1000 acres of riparian vegetation, about 20 percent of which is native species; and about 500 acres of desert brushlands, with substantial salt cedar invasion. Approximately 3,200 acres of desert upland exist. The site has nearly 400 acres of cattail marsh at Bill Williams River delta and about 500 acres of open water on Lake Havasu.

Riparian acreage was originally composed almost entirely of a cottonwood and willow association including 800 acres of closed canopy cottonwood willow gallery. The acreage for other habitat has remained fairly constant but salt cedar invasion has continued to accelerate in both riparian and brushland habitats.

Water. The Bill Williams River NWR has a consumptive right of approximately 1,110 acre feet. Water quantities are influenced by releases at Alamo Dam, removals from surface waters by upstream users, and subsurface pumping by the City of Scottsdale. Major losses of native riparian vegetation have occurred since 1980 due to water problems. This trend is likely to continue without intervention from higher levels. Subsurface pumping by the City of Scottsdale on the Planet Ranch may be having the greatest adverse impact on downstream water needs of the Refuge. Hydrological studies are currently being completed by the Service as a basis for addressing this issue. Water released from Alamo Dam is controlled by U.S. Army Corps of Engineers. Application for instream-flow is being sought.

Wildlife use. Use includes the following threatened and endangered species: Federally listed--Yuma clapper rail, southern bald eagle, brown pelican, peregrine falcon, bonytail chub, razorback sucker, and Colorado squawfish. Arizona listed: lowland leopard frog, great egret, black rail, willow flycatcher, snowy egret, osprey, yellow billed cuckoo, Clark's grebe, least bittern, desert tortoise, Yuma puma, and common black hawk. Other species: desert bighorn, javelina, several riparian obligate avian species, several species of waterfowl and shorebirds. Sport fisheries: Moderate to heavy use for striped bass, largemouth bass, catfish, and carp. Native fisheries: There is an effort underway to reintroduce native nonlisted fishes such as longfin dace, roundtail chub, and Sonoran sucker into the Bill Williams River on the Refuge.

Public use. Use is primarily fishing on the lake portions of the delta. Limited small game hunting and sightseeing occurs on the Refuge.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(14)(15)(16)

Strategies:

1. Maintain strong working relationship with Army Corps of Engineers to ensure a reasonable supply of water for riparian maintenance.
2. Restore native vegetation where possible.
3. Participate in efforts to result in Federal acquisition of the Planet Ranch for habitat and water management purposes.
4. If Planet Ranch is transferred to Federal ownership and the Service becomes responsible for management of fish and wildlife resources, the Service will maintain a limited crop program in support of Canada goose populations.

---

[66]Should the Planet Ranch be acquired or jointly managed with another land management agency, approximately 8,389 acres would become a part of the Bill Williams River NWR management regime.

5. Implement additional hydrological study and analysis.
6. Use Geographical Information Systems (GIS) if possible for resource mapping.
7. Establish limited farming for Canada geese if feasible.
8. Establish a revegetation research center for the lower Colorado River.
9. Establish a plant materials center.
10. Apply for Registered Natural Landmark status.
11. Establish cooperative agreements for joint management with BLM and/or AGFD.
12. Use fencing to control the negative effects of public access.
13. Apply for Wild and Scenic Rivers status.
14. Continue to participate in the Bill Williams River Technical Committee.

Cibola NWR Management Units/Subunits
MAP 6

1. Arizona North Management Unit

MANAGEMENT SUBUNITS	HABITAT TYPE	WILDLIFE USE
A. Farm Subunit #1 (1,200 acres)	croplands, moist soil, seasonally flooded ponds,	sandhill cranes, Canada geese, shorebirds, invertebrates, other waterfowl
B. Arizona North Revegetation Subunit (40 acres)	cottonwood, willow, atriplex, salt cedar, mesquite	passerine, quail, invertebrate, deer, coyotes, amphibians

2. Hart Mine Marsh Management Unit

MANAGEMENT SUBUNITS	HABITAT TYPE	WILDLIFE USE
A. Farm Subunit #2 (300 acres)	cropland (high alkaline)	cranes, geese, ibis, other marsh and waterbirds
B. Hart Mine Marsh Subunit (300 acres)	cattail marsh, salt cedar, open water, mesquite	fisheries, marsh and waterbirds, waterfowl
C. Hart Mine Revegetation (150 acres)	salt cedar, mesquite	POTENTIAL: passerine, neotropical songbird
D. Old River Bend Subunit (200 acres)	old river bottomland, salt cedar, some marsh	small mammals, Yuma clapper rail, marsh birds

3. Island Management Unit

MANAGEMENT SUBUNITS	HABITAT TYPE	WILDLIFE USE
A. Revegetation Subunit (300 acres)	cottonwood, willow, salt cedar, limited marsh	small mammals, raptor, passerine, reptiles
B. Farm Subunit #3 (500 acres)	cropland	upland game, seed eating passerines, small mammals, reptiles, some waterfowl
C. Island Moist Soil Subunits (300 acres)	moist soil plants and salt cedar	shorebirds, swans, waterfowl, upland game, migratory birds
D. Upland Management Subunit (200 acres)	salt cedar, screwbean and honey mesquite	small and large mammals, raptors, passerine

4. California Management Unit

MANAGEMENT SUBUNITS	HABITAT TYPE	WILDLIFE USE
A. Three Fingers Lake Subunit (300 acres)	open water, salt cedar, mesquite, cottonwood, willow	egrets, herons, small mammals, amphibians, invertebrates, largemouth bass, carp
B. California North Revegetation Subunit (200 acres)	salt cedar	small and large mammals, raptors, limited passerine
C. California North Boundary Subunit (30 acres)	mesquite, willow, salt cedar	small and large mammals, passerine
D. California South Revegetation Subunit (100 acres)	salt cedar	raptor, passerine, small mammals

5. Cibola Lake Management Unit

MANAGEMENT SUBUNITS	HABITAT TYPE	WILDLIFE SPECIES
A. North Cibola Lake Subunit (100 acres)	small impoundment, upland, salt cedar	marsh and waterbirds, Yuma clapper rails, herons
B. Cibola Lake Lacustrine Subunit (600 acres)	open water, marsh, emergent, salt cedar	marsh and waterbirds, Yuma clapper rail, waterfowl, raptors, passerine, fisheries

6. Cibola Special Project Areas/ MAP 7

ACTIVITY AREA	HABITAT/ACTIVITY TYPE	WILDLIFE SPECIES
#1. Cibola Lake (600 acres)	marsh, open water, emergents, salt cedar/ PROJECT	marsh and waterbirds, Yuma clapper rail, waterfowl, raptors, passerine, fisheries, POTENTIAL: passerine and raptors, sport fisheries
#2. Three Finger Lake (300 acres) Rehabilitation	marsh, wooded, open water, mesquite, salt cedar/PROJECT	raptors, marsh and waterbirds, mammals, POTENTIAL: raptors, waterbirds, passerines, fisheries
#3. Island Unit (5,000 acres) Canal Rehabilitation and Revegetation	mesquite/salt cedar, agricultural, potholes, shallow marshes/PROJECT	passerine, raptors, waterfowl, marsh and waterbirds
#4. Hart Mine Marsh (300 acres) Rehabilitation	cattail marsh/PROJECT	marsh and waterbirds, waterfowl, fisheries
#5. Old River Channel (350 acres)	riparian, cattail, marsh, salt cedar, salt bush/PROTECTION	shorebirds, marsh and waterbirds, raptors, amphibians, waterfowl, aquatic plants POTENTIAL: endangered fishery
#6. Palo Verde Irrigation District Outfall Drain/ Pretty Water Junction (50 acres)	marsh, emergents/PROJECT	shoreline invertebrates, marsh and waterbirds, Yuma clapper rail
#7. Pretty Water (65 acres) Enhancement	marsh, emergents/PROJECT	fisheries, marsh and waterbirds, waterfowl POTENTIAL: endangered fishery
#8. Refuge Revegetation Site 1 (40 acres)	atriplex, cottonwood, willow, mesquite/PROJECT	mammals, passerine, migratory birds POTENTIAL: game mammals, upland birds, passerine
#9. Refuge Revegetation Fire Site (300 acres)	cottonwood, willow, salt cedar, limited marsh/PROJECT	marsh and waterbirds, raptors, bald eagles, passerine POTENTIAL: passerine, waterbird rookery, raptors
#10. California North Boundary (30 acres) Revegetation	mesquite, willow/PROJECT	game mammals, passerine, raptors, neotropical songbirds
#11. California River Dry Cut (20 acres) Revegetation	dry cut, marsh, cottonwood, willow/PROJECT	POTENTIAL: marsh and waterbirds, passerine, raptors, neotropical songbirds

SPECIAL PROJECT AND PROTECTION AREAS:
CIBOLA NATIONAL WILDLIFE REFUGE
MAP 7
1. Cibola Lake

Size: 600 surface acres (2 miles in length) Ownership. The site is owned by the Service.

Habitat description: Cibola Lake is approximately 600 surface acres in size and is approximately 2 miles in length. It is a man made lake created after dredging activities left it dry in the 1960s.

Wildlife use: The lake attracts several species of wildlife, including nesting species such as Yuma clapper rails (endangered), several species of marsh and waterbirds and waterfowl. Nesting near the fringe of the lake and commonly seen passerine species are the yellow-breasted chat and the common yellow throat. During the winter, the lake serves as a sanctuary and roosting area for several species of ducks, Canada geese (numbering up to 25,000), and all species mentioned above.

There are several species of fish utilizing the lake. The most abundant game fish are small and largemouth bass and channel and flathead catfish. There are also several species of sunfish, whose numbers have declined along the lower Colorado River and its backwaters.

The Cibola Lake area also serves as habitat for a number of lower animal forms. Numerous invertebrates inhabit the area. Crayfish, one of the chief prey for the endangered Yuma clapper rail, are in abundance.

Public use: No public use.

CMP Goals: (1)(2)(3)(4)(5)(7)(9)(14)

Strategies:
1. Eradication of monotypical stands of salt cedar.
2. Revegetation of cottonwood and willow species near the lake's edge to provide nesting and lofting habitat for herons and egrets, the Refuge's raptor population, and perches for bald eagles and ospreys.
3. Pump and transport water from channel.
4. Evaluate effect of water level management on fishery.

2. Three Finger Lake

Size: 300 acres Ownership: The site is owned by the Service.

Habitat description: Although renovation is in dire need, the Three Finger Lake area remains a very important wetland community. It is located along the Old River Channel on the California side of the Refuge. Three Finger Lake encompasses approximately 300 acres, though its wetlands are considerably less. It consists of both wooded and shallow areas.

Water: Water availability is dependent upon river flows and groundwater levels.

Wildlife use: Wooded shallow areas provide excellent feeding for egrets, herons, and occasionally ospreys. The upland areas provide food and cover for mammals such as the mule deer. Milpitas Wash, a large wash which extends to the lake, is used as a travel lane for many species which use the area.

Public use: No public use.

CMP Goals: (1)(2)(3)(4)(5)(7)(8)

Strategies:
1. Create an inlet canal to facilitate water circulation throughout the channel and encouraging voluntary growth of native species such as cottonwood and willow.
2. Establish rookeries for herons and egrets and perches for bald eagles and ospreys near the lake's edge.
3. Push for upgrade in mitigation priority with BR.
4. Dredge inlet canal. Install new pipe where required.
5. Establish agreement with BR for inlet cleaning.

3. Island Unit

Size: 5,000 acres Ownership: The site is owned by the Service.

Habitat description: The Island Unit was created when the channelized portion of the Colorado River (Dry Cut) was constructed in the Cibola, Arizona area prior to the establishment of the Refuge. It is characterized by approximately 5,000 acres of upland divided equally with mature mesquite and salt cedar. Approximately 500 acres were farmed in the past and have been reduced to less than 100 acres. Many of the remaining acres are used as moist soil units when water conditions are favorable. The lowlands are characterized by potholes, old river meanders, and sloughs left dry after dredging activities within the Dry Cut. After some rehabilitation, some of the wetlands have been revitalized, thereby reestablishing a most important wetland community. By far, it is the most diversified area on the refuge and, by its standard, on most refuges.

Water: Water availability is very dependent on river flows and groundwater levels are based on those flows. During high water times, the old river meanders, sloughs, and potholes have sufficient water to provide for habitat.

Wildlife use: Use by a variety of avian species, including marsh and waterbirds that frequent potholes and sloughs when water levels allow. The farm fields provide feeding for migratory waterfowl. The cottonwoods and willows, although few, provide breeding and wintering habitat for passerine and neotropical species.

Public use: Minimal use allowed for wildlife observation.

CMP Goals: (1)(2)(4)(5)(7)(8)(14)

4. Hart Mine Marsh

Size: 300 surface acres (when project is completed.) Ownership: The site is owned by the Service.

Habitat description. The area is primarily a cattail marsh habitat.

Wildlife use: Although not completed, the Hart Mine serves as an excellent loafing and feeding area for egrets and herons and as a wintering area for many species of ducks, particularly teal and mallard. The area is a frequent site for the few wood ducks that visit the area during the wintering season.

The Hart Mine Marsh hosts several species of aquatic life forms. Most numerous are talapia, bass, and a few catfish. These, of course, are restricted to the main inlet drain and the deep part of the marsh area.

Public use: No public use.

CMP Goals: (1)(2)(3)(4)(5)(7)(9)(14)

Strategies:
1. Interlocking canals must be designed and excavated.
2. Some channels will need to be dredged and deepened.
3. A siltation basin needs to be designed and constructed.
4. An outlet structure needs to be designed and installed at the tie back levee. (Separate outlet with two-way pump).

5. Old River Channel

Size: 350 surface acres. 9 miles length/ 300-350 feet in width. Ownership: The site is owned by the Service.

Habitat description: The old river channel portion of the Colorado River is approximately 9 miles in length and consists of excellent edges of cattail and bulrush with a scattering of salt cedar and other plants. Some of the other plants include various aquatic plants and abundant growths of yellow netsedges. The banks range from a steep to gradual slope and consist of sand to a sandy loam soil. Because of the contour and thick vegetation near access points, human encroachment is limited, thereby providing for a diversity of species that are left undisturbed.

Water: Water is dependent on groundwater levels of the channelized River.

Wildlife use: The Old River Channel provides an excellent ecosystem for several species including shorebirds, ducks, egrets, herons, greater sandhill cranes, bald eagles, ospreys, and many species of fish and amphibians. Unlike the Dry Cut, the Old River channel is not rip-rapped and boating and water skiing is not permitted.

CMP Goals: (1)(2)(3)(4)(5)(7)(9)

Strategies:
This area is to be protected from recreation activity, such as boating and water skiing, and preserved as shorebird and dabbling duck habitat. There is a potential for use of the Old River Channel to develop grow-out ponds for the Colorado River endangered native fishes.

6. Palo Verde Irrigation District Outfall Drain/ Pretty Water Junction

Size: 50 acres Ownership: The site is owned by the Service.

Habitat description: Years ago, the Palo Verde Irrigation District Outfall Drain was tied into the Colorado River just north of Mitchell's Camp. When the Dry Cut was completed, water flow was diverted from the portion of the Colorado River termed the "Old River Channel." The combination of the former led to the development of a sill at the junction where the drain met the Colorado River. This brought about a condition where siltation gradually filled in the area, thereby completely changing the ecological environment. The former condition gave rise to shallow growing species such as duck weeds, cattail, bulrush, smartweed, and other plants.

Water (See Habitat Description): Water availability is dependent upon groundwater levels based upon annual releases from Parker Dam.

Wildlife use: This area provides habitat for shoreline invertebrates and marsh dwelling species such as the Yuma clapper rail. The Palo Verde Irrigation District Outfall Drain/Pretty Water Junction has been one of the best areas on the Refuge for producing the endangered Yuma clapper rail.

Public use: No public use.

CMP Goals: (1)(2)(3)(4)(5)(7)(9)

Strategies:
1. Routine habitat management activities such as pothole or channel blasting will periodically be needed in order to maintain an acceptable water to vegetation ratio.
2. Other than monitoring, little, if any, management is needed.

7. Pretty Water

Size: 65 acres. 1.41 miles in length. 300-350 feet width. Ownership: The site is owned by the Service.

Habitat description: Pretty Water lies in the upper or northernmost portion of the Old River Channel. It begins where the dredging of the Colorado left the main channel to start the Dry Cut. The upper portion is characterized by dense growths of cattail and bulrush, with an impenetrable emergence of water that provides excellent cover for fishery and adds to the protection of the area. The lower end has been sealed by an accumulation of sediment that has transformed the area into an excellent bulrush-cattail community.

Water: Water is dependent on river flows and groundwater levels.

Wildlife use: Both sections of the area serve as important nesting areas for the endangered Yuma clapper rail.

Public use: No public use.

CMP Goals: (1)(2)(3)(4)(5)(7)(9)

Strategies:
1. Maintenance and habitat monitoring.

8. Revegetation Site -- Refuge

Size: 40 acres Ownership: The site is owned by the Service.

Habitat description: The refuge's 40-acre revegetation site was established in 1979. While it is not considered a "representative" site, it does possess a scattering of cottonwoods, willows, mesquite, and tremendous growth of atriplex.

Water: Dependent on river flows and groundwater levels.

Wildlife use: The site supports a diversity of nesting birds and provides excellent habitat for resident species such as Gambel's quail, mule deer, and other small mammals.

Public use: No public use

CMP Goals: (1)(2)(4)(5)(7)(8)

Strategies:
1. Maintain existing site by monitoring for salt cedar invasion.
2. Develop fire lane.

9. Revegetation (Island Unit)[67]

Size: 200-300 acres Ownership: The site is owned by the Service.

Habitat description: Approximately 200-300 acres are to be revegetated following a wildfire which destroyed some of the last large cottonwoods and willows on the Refuge. Destroyed with the important riparian habitat were two colonies of egret and heron rookeries, red tailed hawk nests, perches for raptors such as bald eagles and ospreys, and habitat for nesting passerines and white-winged and mourning doves.

There are two sites targeted for revegetation. One is located near the dry cut portion of the Colorado River and the refuge ponds and marshes. The other is located near the old river channel portion of the Colorado River and will serve as an excellent site for nesting and loafing raptors and songbird species.

Water: Water is dependent upon groundwater levels, pumping, river flows.

Wildlife use: When revegetated, these will be of use to nesting and loafing raptors and songbird species.

Public use: No public use.

CMP Goals: (1)(2)(4)(5)(7)(8)

Strategies:
1. Establish an interspersion of tall trees and native shrubs that will serve as riparian habitat for a variety of wildlife species.
2. Replant cottonwood and willow.
3. Bulldoze monotypical stands of salt cedar.

10. California North Boundary

Size: 30 acres. 3,500 feet length. Old river bottom 250 feet wide. Ownership: The site is owned by the Service.

Habitat description: The north boundary of the California side of the Refuge follows along the original path of the Colorado River before the channel moved to its new location (Pretty Water). This former boundary line of Arizona and California is now characterized by tremendous growths of mature mesquite and willows.

Water: Water availability is dependent on river flows and groundwater levels.

[67]In June 1991 the Fire Management funds were appropriated for the revegetation of the Island Unit. The amount of the contractor's bid was approximately $233,000. All of the necessary salt cedar eradication had taken place. The refuge manager estimated that this Targeted Core Habitat will have a mature stand of cottonwoods and willows in the necessary quantity and densities to support some of the extirpated and near extirpated neotropical songbirds and raptors by 1996.

Wildlife use: It serves as nesting habitat for many species of birds and loafing and cover for mammals such as the mule deer. It also provides a very important buffer between the Refuge and a nearby private farm.

Public use: No public use.

CMP Goals: (1)(2)(4)(5)(7)

Strategies:
1. Area should be patrolled more often.
2. No other active management suggested.

11. Revegetation Site -- Dredge Spoil, Off Refuge

Size: 40 acres Ownership: The site is owned by BR.

Habitat description: Representing approximately 40 acres, the "Dredge Spoil" revegetation site represents a model for revegetation. It consists of cottonwood, willow, and other native vegetation. There is also an exotic representation (eucalypti trees) planted primarily to experiment growth versus native species.

Water: Availability is dependent on River flows and groundwater levels.

Wildlife use: The Dredge Spoil Site was one of the areas chosen for the release of Harris' hawks during 1986 and 1988. The area supports nesting for a variety of passerine and neotropical species, and white winged mourning doves. Also, many species of small reptiles and mammals are abundant.

Public use: No public use.

CMP Goals: (1)(2)(4)(5)(7)(8)

Strategies:
1. Continue to work with researchers (Ohmart-Anderson experimental plot) off the Refuge.
2. Acquire the site for Harris hawk management (water rights intact).

Non Fish and Wildlife Service Owned Lands and Waters

a. Cibola Irrigation District -- Old River Meander

Size: 4,000 acres Ownership: The site is owned by the Cibola Valley Irrigation District.

Habitat description: Located immediately to the north of Cibola NWR's northern boundary lies the Cibola Valley Irrigation District. There are approximately 4,000 acres within the district and at first glance it does not appear to be very wildlife oriented. However, there are areas that could potentially be developed or reclaimed into major wildlife sanctuaries. One of these areas is the Old River Meander. Although a portion of the meander has been filled, there are still many remaining acres that would be developed into excellent wetland communities.

Water: Water rights are desirable with the property should it be acquired. This would include allotments already in place for this land with diversionary rights from the river. Groundwater pumping could also be done if necessary.

Wildlife use: The a large area could be transformed into a sanctuary for neotropical species. Another section could be actively farmed to provide additional wintering for migratory waterfowl.

Public use: Wildlife Observation could be planned for this area as well as regulated hunts for migratory waterfowl and other game species.

CMP Goals: (1)(2)(4)(5)(6)(7)(8)

Strategies:
1. Acquire site owned by Cibola Valley Irrigation District.
2. Revegetate approximately 3,000 acres with native cottonwood/willow.
3. Acquire at least 18,000 acre feet of water rights or pool water rights with Imperial NWR to allow for use of Imperial NWR's allocation in sufficient quantities to engage in revegetation strategies and farming for migratory bird use (approximately 1,000 acres. (See Goal #6).
4. Farm approximately 1,000 acres for waterfowl and other migratory bird use.
5. Manage area as sanctuary for migratory birds (i.e., close to hunting).

b. Colorado River Oxbow Unit

Size: 400 acres Ownership: BR

Habitat description: The Colorado River Oxbow unit was created when the BR straightened the Colorado River by channelization. This created an island of approximately 400 acres. The Old River Channel portion is equipped with an inlet and outlet to aid water movement and manage water levels. The entrance of the oxbow is characterized by a shallow elevation, thereby facilitating use by shorebirds and dabbling ducks. The rest of the channel has a moderate depth with a steep to shallow sloping embankment.

The upland area consists of approximately 250 acres of farmland. The rest consists of a wide buffer zone between the farm fields and River and has a mixture of cottonwood, willow, salt cedar, and mesquite. The area of the most significance and with, perhaps, the most potential lies on the California side of the Colorado River Oxbow. This area exhibits a sloping bank line which could provide excellent ponds and sloughs and support native plant revegetation at higher elevations.

Water: Water availability is directly tied to river flows and groundwater levels.

Wildlife use: There is an abundance of aquatic emergents throughout. The area receives moderate to heavy use from waterfowl and marsh birds during fall and winter. There is use by shorebirds and dabbling ducks.

Additional ponds and sloughs would enhance this ecosystem by providing additional nesting habitat for a wide variety of marsh and waterbirds and adjacent trees could certainly provide rookery habitat for herons and egrets.

Public use: None would be planned if acquired.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(14)

Strategies:
1. Acquire property with water rights (100 acre-feet available).
2. Develop agreement with county government regarding management of public park area.

3. Work with BR to protect egret rookery.

c. California River Meander

Ownership: The site is owned by the State of California.

Habitat description: Prior to channelization, the Colorado River meandered along its present course in the Cibola District. After straightening the River, over a mile of these old river bottoms was left. Some of the wetlands still remain intact, but with a limited water source.

Water: Dependent on groundwater levels and River flows.

Wildlife use: This area serves as habitat for many species of marsh and waterbirds. The major problem so far has been human encroachment.

Public use: Wildlife observation would be planned if acquired.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(11)

Strategies:
1. Work with States of California and Arizona in clearing up the boundary issues. Formulate agreements if necessary.
2. Propose cooperative management.
3. Develop rookery.
4. Manage for Yuma clapper and black rails.

d. Major Washes

Ownership: This site is owned by the BLM.

Habitat description: There are several large washes located within this described area that empty into the Colorado River.

Water: Water availability here is dependent upon annual precipitation levels.

Wildlife use: These washes provide habitat for many species of birds, mammals, reptiles, and other species. Although tortoise surveys have not been completed in these areas, habitat exists that should support the desert tortoise, which is threatened in Arizona. At present, off-road vehicle destruction and habitat degradation have not been a problem throughout most of these areas. Most of the impact has been near the River where boaters and campers congregate.

Public use: Boating and camping is allowed near the River.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(15)

Strategies:
1. Work with BLM biologists concerning neotropicals in the major wash areas and how habitat work on refuges affects populations and vice versa.
2. Enter into cooperative management agreements if necessary for habitat enhancement opportunities.
3. Promote additional research in behalf of neotropical species, in coordination with BLM biologists.

e. Colorado River Dry Cut Flood Plain

Size: Runs the full length of the Refuge and is the channelized portion of the River. The area of principal concern is the lower end, which consists of 20 acres.

Ownership: This site is owned by the Service.

Habitat Description: This area has an abundance of salt cedar. At the very low end, (about 20 acres) the Refuge has a newly planted stand of cottonwood/willow, and has great potential for future larger stands.

Water: Natural sloughs and ponds are located on this site. The land needs to be inundated to manage for California black rails.

Wildlife: Yuma clapper and California black rails could potentially use the area. The ponds and sloughs would nest many species of shorebirds and passerine species such as Lucy's warblers.

Public Use: There is no public use in the area.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)

Strategies:
1. Plant additional poles of cottonwoods.
2. Inundate lower areas with water for rail habitat development.
3. Maintain natural sloughs and ponds.

Imperial NWR Management Units/Subunits
MAP 8
1. Martinez Lake and Riverbank Management Unit

MANAGEMENT SUBUNITS	HABITAT TYPE	WILDLIFE USE
A. East Farm Subunit (240 acres)	croplands, some marsh	waterfowl, marsh and waterbirds, raptors, mammals
B. West Moist Soil Subunit (160 acres)	marsh, moist soil, open water, cottonwood	waterfowl, marsh and waterbirds, Yuma clapper rail, raptors
C. Martinez Lake Riverbank Subunit (260 acres)	salt cedar, marsh, cottonwood, willow, mesquite	marsh and waterbirds, Yuma clapper rail, raptors, peregrine falcon, passerine, neotropical songbirds

2. Martinez Marsh/Upland Management Unit

MANAGEMENT SUBUNITS	HABITAT TYPE	WILDLIFE USE
A. Backwater Lake/Marsh Subunit (500 acres)	backwater lakes, wetland and marsh, cattails, open water, salt cedar and palo verde, mesquite on edges, cottonwood and willow	marsh and waterbirds, Yuma clapper rail, waterfowl, raptors, peregrine falcon, passerine, neotropical songbirds, fisheries
B. Martinez Upland Subunit (500 acres)	desert washes, streambed, palo verde, creosote, mesquite, salt cedar, ocotillo and other native Sonoran desert cacti	large mammals, raptors, golden eagles, passerine, reptiles, amphibians

3. Ferguson Lake and Shore Management Unit

MANAGEMENT SUBUNITS	HABITAT TYPE	WILDLIFE USE
A. Lake and Marsh Subunit (800 acres)	open water, marsh, emergents, cottonwood, willow, salt cedar, mesquite	marsh and waterbirds, Yuma clapper rail, waterfowl, raptors, peregrine falcon, passerine, sport fisheries
B. Ferguson Shore and Upland Subunit (1000 acres)	sand beach, emergents, cottonwood, willow, salt cedar, palo verde, mesquite	shorebirds, passerine, raptors, mammals, reptiles, amphibians

4. Backwater Riveredge Management Unit

MANAGEMENT SUBUNITS	HABITAT TYPE	WILDLIFE USE
A. Arizona Riveredge Subunit (2,989 acres)	riverbank, woodlands, salt cedar, arrowweed, cottonwood, willow, mesquite, marsh, uplands, desert wash, streambeds, riverine	marsh and waterbirds, Yuma clapper rail, raptors, fisheries, passerine, neotropical songbirds
B. California Riveredge Subunit (2,620 acres)	riverbank, woodlands, salt cedar, arrowweed, cottonwood, willow, mesquite, marsh, uplands, desert wash, streambeds, riverine	marsh and waterbirds, Yuma clapper rail, raptors, fisheries, passerine, neotropical songbirds

5. Wilderness Management Unit

MANAGEMENT SUBUNITS	HABITAT TYPE	WILDLIFE USE
A. Desert Wilderness Area/ Az. (9,220 acres)	desert washes and stream bed, rocky outcroppings, desert flats, cacti, creosote, brush, mesquite	desert bighorn, desert tortoise (sonoran), reptiles, amphibian, coyote, burros, small mammals, raptors, passerine, quail, dove
B. Proposed Desert Wilderness Area /Ca. (5,836 acres)	desert washes and stream bed, rocky outcroppings, desert flats, cacti, creosote, brush, mesquite	desert bighorn, desert tortoise (sonoran), reptiles, amphibian, coyote, burros, small mammals, raptors, passerine, quail, dove
C. Upland Desert Subunit / Ca. (1,000 acres)(Buffer Zone)	desert washes and stream bed, rocky outcroppings, desert flats, cacti, creosote, brush, mesquite	desert bighorn, desert tortoise (sonoran), reptiles, amphibian, coyote, burros, small mammals, raptors, passerine, quail, dove

6. Imperial Special Project Areas/ MAP 9

ACTIVITY AREA	HABITAT/ACTIVITY TYPE	WILDLIFE USE
#1. East Farm Subunit Irrigation Improvements (240 acres)	agricultural, marsh/PROJECT	waterfowl, raptors, mammals, marsh and waterbirds
#2. West Farm Subunit Irrigation Improvements (160 acres)	marsh, open water, cottonwood, willow/PROJECT	waterfowl, marsh and waterbirds, yuma clapper rail, raptors
#3. Martinez Marsh and Upland (600 acres)	cattail, giant bulrush, giant cane, cottonwood, willow, screwbean mesquite/PROJECT	marsh and waterbirds, Yuma clapper rail, raptors, bald eagle, passerine, small mammals, game mammals
#4. Martinez Lake and Riverbank Revegetation (260 acres)	salt cedar, marsh cottonwood, willow, mesquite/PROJECT	marsh and waterbirds, Yuma clapper rail, waterfowl, raptors, peregrine falcon POTENTIAL: passerine, neotropical songbirds
#5. Martinez Marsh Enhancement (400 acres)	marsh, salt cedar, cottonwood, willow/PROJECT	marsh and waterbirds, Yuma clapper rail, waterfowl, raptors, peregrine falcon POTENTIAL: passerine, neotropical songbirds, fisheries, endangered fish
#6. Ferguson Lake and Shore Management Unit (750 acres)	open water, marsh, islands, salt cedar, cottonwood, willow/PROJECT	marsh and waterbirds, Yuma clapper rail, waterfowl, raptors, peregrine falcon, fisheries POTENTIAL: passerine, neotropical songbirds
#7. Backwater Riveredge/Arizona (2,989 acres)	riverbank, woodlands, salt cedar, arrowweed, cottonwood, willow, mesquite, marshes, uplands, desert wash, open water, riverine/PROJECTR/ PROTECTION	marsh and waterbirds, Yuma clapper rail, waterfowl, raptors, peregrine falcon, fisheries POTENTIAL: passerine, neotropical songbirds, endangered fish
#8. Backwater Riveredge/California (2,620 acres)	riverbank, woodlands, salt cedar, arrowweed, cottonwood, willow, mesquite, marshes, uplands, desert wash, open water, riverine/PROJECT/ PROTECTION	marsh and waterbirds, Yuma clapper rail, waterfowl, raptors, peregrine falcon, fisheries POTENTIAL: passerine, neotropical songbirds, endangered fish
#9. Wilderness Management Unit (16,056 acres)	desert washes and stream bed, rock outcroppings, desert flats, cacti, creosote, bruch, mesquite / PROTECTION	desert bighorn, javalina, desert tortoise (sonoran), reptiles, amphibian, coyote, burros, small mammals, raptors, passerine, quail, dove

SPECIAL PROJECT AND PROTECTION AREAS:
IMPERIAL NATIONAL WILDLIFE REFUGE
MAP 9
1. East Farm Management Subunit (240 acres)

Size: 240 acres Ownership: The site is owned by the Service.

Habitat Description: The primary habitat (160 acres) is agricultural cropland, including wheat, ryegrass, millet, milo, and corn. Crops provide forage for wintering and migrating migratory birds, primarily waterfowl. Moist soil units (65 acres) and shallow marsh (15 acres) comprise the remaining 80 acres, and provide habitat for a variety of waterfowl, shorebirds, wading birds and waterbirds. In 1993, a 3-acre cottonwood/willow pole nursery was established. Beginning in 1995, this nursery will provide poles for restoring native hardwoods on suitable sites.

Water: Water supply and quantity is from secured water rights (23,000 acre-feet consumptive, 28,000 acre-feet diversion), pumped into an irrigation ditch system for distribution onto fields. The subunit is contained within a gravel dike, and is subdivided by a series of interior dikes.

An inadequate irrigation system has hampered habitat management activities. In 1993, improvements to 5,000 linear feet of the irrigation canal were completed and a new electric pump was installed, greatly enhancing capabilities and efficiency. Repair of the remaining 5,000 linear feet of irrigation canal is needed.

Wildlife Uses: Overwintering Canada geese, snow geese, mallards, northern pintails, American wigeon, gadwall, tundra swans and greater sandhill cranes utilize green forage and grain crops. White-fronted geese, cinnamon and blue-winged teal and several other waterfowl species utilize moist soil units during migration. Moist soil units also provide migrational and wintering habitat for several shorebird species including long-billed curlew, long-billed dowitcher, willet, white-faced ibis, black-necked stilt, American avocet, least and western sandpipers, and wading bird species including great egret, snowy egret, and great blue heron. Raptors including northern harrier, Cooper's hawk, sharpshinned hawk, red-tailed hawk, osprey, Harris hawk, and kestrel forage over fields. Coyote, bobcat, and mule deer are present. Several passerine species including Say's phoebe, black phoebe and western meadowlark use agricultural lands during winter. Gambel's quail are abundant. In 1993, three Yuma clapper rails was present in the shallow marsh.

Public Use: Public use is not permitted.

CMP Goals: (1)(2)(3)(4)(5)(6)(8)(15)

Strategies:

1. Develop water delivery capabilities to entire management subunit by completing irrigation canal improvements. Determine the feasibility of establishing gravity flows to the subunit (see Martinez Marsh Project) to reduce pumping costs.
2. Develop water management capabilities in moist soil units by installing water control structures.
3. Develop and implement a water management plan, including quantification of water use, determination of effects of irrigation on groundwater levels and movement, and determination of effects of fluctuating Colorado River flows on groundwater and wetland habitats.
4. Develop and implement a cropland/moist soil management plan, incorporating the most advanced soil conservation, water management, and cropping techniques to increase productivity and efficiency, and integrated pest management strategies to control exotic plant species.
5. Utilize Moist Soil Advisor computer software to direct and monitor moist soil management.

6. Maintain and enhance developing stands of three-square and alkali bulrush in moist soil units to provide nesting habitat for California black rails. Following systematic site suitability analyses, restore native cottonwood, willow and mesquite on upland sites within moist soil units. Expand cottonwood/willow pole nursery to 3 acres. Determine the feasibility of using flood irrigation (simulation of short-term flood events) to promote natural reproduction of restored native plants.
7. Maintain and enhance shallow marsh habitat for waterfowl and waterbirds, including nesting Yuma clapper rails, primarily with water management and control of exotic vegetation.
8. Develop and implement a spring and fall watering schedule to provide migrational habitat for shorebirds.

2. West Farm Moist Soil Management Subunit

Size: 160 acres Ownership: The site is owned by the Service.

Habitat Description: The primary habitat (120 acres) is currently salt cedar and giant cane, with the former dominating on moist sites and the latter dominating on drier upland sites. Small remnant stands of willow exist adjacent to shallow marshes. Cattail and giant bulrush are the predominant emergents in the shallow marshes (40 acres).

Increasing salinity in wetlands due to high rates of evaporative water loss has decreased productivity and the functional value of existing wetlands in this management subunit. Plant encroachment and succession has converted former shallow marshes to monotypic stands of exotic vegetation, and this process is ongoing in existing wetlands. Water delivery capability is needed to restore former wetlands and maintain and enhance existing wetlands.

Water: Current water supply and quantity is from the Colorado River via groundwater seepage. Secured water rights (23,000 acre-feet consumptive, 28,000 acre-feet diversion) are available for development of water delivery capability to this subunit. The subunit is contained within gravel dikes, and is subdivided by a series of interior dikes.

Wildlife Use: In 1993, five Yuma clapper rails were recorded in shallow marsh habitats within this subunit. These wetlands also provide wintering and migrational habitat for several waterfowl, waterbird, and wading bird species, including white-fronted geese, mallard, green-winged and cinnamon teal, northern pintail, gadwall, greater sandhill cranes, American coot, eared and pied-billed grebes, great egret, snowy egret, great blue heron, green-backed heron, and least and American bitterns. Osprey and wintering southern bald eagles forage in wetlands. Other raptors present include northern harrier, Cooper's hawk, sharpshinned hawk, red-tailed hawk, osprey, Harris hawk, and kestrel. Remnant willow stands provide nesting, wintering, and migrational habitat for several resident songbird and neotropical migratory bird species. The are also used as roosts by herons and egrets, and as they mature, will provide rookery habitat. Gambel's quail are abundant. Coyote, bobcat, mule deer, and several species of small mammals, reptiles, and amphibians are present.

Public Use: Public use is not permitted in this management subunit. Human-caused wildfires, originating from recreational activities on and along the Colorado River, are the primary threat to resources. Encroachment of non-native plants, which provide few benefits for wildlife, follows wildfires.

CMP Goals: (1)(2)(4)(5)(6)(7)(8)(9)(15)

Strategies:

1. Improve water quality in wetlands and provide irrigation water for native plant revegetation by developing water delivery capability to entire subunit. Determine the feasibility of establishing gravity flows to the subunit (see Martinez Marsh Project).
2. Develop water management capability by installing water control structures.
3. Develop and implement a water management plan, including quantification of water use (consumptive and diversion), determination of effects of irrigation on groundwater levels and movement, and determination of effects of fluctuating Colorado River flows on groundwater and wetland habitats.
4. Restore former wetlands using mechanical manipulation to remove existing stands of exotic vegetation and sediments.
5. Monitor water quality in wetlands, and where possible, implement water management strategies to prevent contaminant build-up.
6. Maintain and enhance existing shallow marsh habitat for waterfowl and waterbirds, including nesting Yuma clapper rails, primarily with water management and control of exotic vegetation.
7. Following systematic site suitability analyses, restore native cottonwood, willow, and mesquite to upland sites. Utilize combination of mechanical manipulation, prescribed fire, and herbicide application to control exotic plant species to prepare and maintain revegetation sites. Determine the feasibility of using flood irrigation (simulation of short-term flood events) to promote natural reproduction of restored native plants.
8. Develop and implement a moist soil management plan, incorporating the most advanced soil conservation and water management techniques to increase productivity and efficiency, and integrated pest management strategies to control exotic plant species. Utilize Moist Soil Advisor computer software to direct and monitor moist soil management.
9. Maintain and enhance developing stands of three-square and alkali bulrush in moist soil units to provide nesting habitat for California black rails.
10. Develop and implement a spring and fall watering schedule to provide migrational habitat for shorebirds.
11. Maintain fire breaks around subunit, utilizing existing dike road network.
12. Increase fire prevention activities.

3. Martinez Upland Management Subunit

Size: 500 acres Ownership: The site is owned by the Service.

Habitat Description: Stands of cattail and giant bulrush are present along the eastern shore of the dredge canal extending north from Martinez Lake and in the Dancing Circle marsh east of the canal. Saltcedar, giant cane and arrowweed are the primary vegetation on upland sites along wetlands in this subunit. Small remnant stands of willow, and occasional cottonwood and screwbean mesquite trees are present. Significant stands of honey mesquite are present in desert washes closest to the Colorado River floodplain. More upland sites in the washes contain ironwood and paloverde, with an understory comprised of quailbush, desert broom, chuperosa, and catclaw acacia.

Increasing salinity in wetlands due to high rates of evaporative water loss has decreased productivity and the functional value of existing wetlands in this management subunit. Plant encroachment and succession has converted former shallow marshes to monotypic stands of exotic vegetation, and this process is ongoing in existing wetlands.

Water: Water supply and quantity is dependent on Colorado River flows, through backflow into Martinez Lake, and groundwater seepage into shallow marshes.

Wildlife Uses: Wetland habitats in this management unit provide wintering and migrational habitat for several waterfowl, waterbird, wading bird, and shorebird species. Marshes provide habitat for great and snowy egrets; great blue, black-crowned night and green-backed herons; and American and least bitterns. No Yuma clapper rails were recorded in this subunit in 1993, although potential habitat is present. Osprey and southern bald eagles forage in open water habitats, peregrine falcons have been observed in the unit, and desert washes and uplands are used by Harris hawks, Cooper's hawks, prairie falcons, and great-horned and western screech owls. Remnant stands of willow and cottonwood and honey mesquite provide important habitat for several resident songbird and neotropical migratory bird species. Coyote, bobcat, mule deer, feral burros, and horses and several species of small mammals, reptiles and amphibians are present.

Public Use: This management subunit provides the primary sites for interpretation and wildlife observation opportunities for Refuge visitors on foot or in vehicles. The Visitor Center/Headquarters building, the 1-mile Painted Desert hiking trail, and four vehicle-accessible overlooks of backwater wetlands are centers of attraction. The Red Cloud Mine Road, a designated county right-of-way, bisects the subunit and provides access through the Refuge to the Red Cloud Mine in La Paz County.

Human-caused wildfires originating from recreational activities along the Colorado River and Martinez Lake and burning into riparian habitats and desert washes are a threat to native habitats. Encroachment of non-native plants, which provide few benefits for wildlife, follows wildfires. Illegal off-road vehicle activity occurs throughout the unit, and is concentrated in McCallister Wash.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(9)(10)(12)(13)(14)(15)

Strategies:

1. Improve biological databases, with emphasis on avian, mammalian, amphibian, and reptilian species of concern.
2. Develop and implement interpretive/environmental education plan to increase the quantity and quality of wildlife observation and interpretation opportunities and to increase public awareness of refuge regulations and refuge mission through development of interpretive facilities and written materials, improved signage, and increased enforcement.
3. Develop and implement a water management plan, including quantification of water use (consumptive and diversion), determination of effects of irrigation on groundwater levels and movement, and determination of effects of fluctuating Colorado River flows on groundwater and wetland habitats.
4. Restore former wetlands in the Dancing Circle Marsh using mechanical manipulation to remove stands of exotic vegetation and sediments.
5. Monitor water quality in wetlands, and where possible, implement water management strategies to prevent contaminant build-up. Following systematic site suitability analyses, restore native cottonwood, willow, and mesquite to upland sites. Utilize combination of mechanical manipulation, prescribed fire, and herbicide application to control exotic plant species to prepare and maintain revegetation sites.
7. Construct and maintain fire breaks to protect native plant stands.
8. Increase fire prevention activities.

4. Martinez Lake/Riverbank Management Unit

Size: 260 acres Ownership: The site is owned by the Service. A 2-acre area at the entrance to Martinez Lake is owned by the State of Arizona.

Habitat Description: Salt cedar, giant cane and arrowweed are the primary vegetation on upland sites along the Colorado River. Extensive stands of cattail and giant bulrush are present along the western shore of

Martinez Lake. Small remnant stands of willow, and occasional cottonwood and screwbean mesquite trees, are present. Spiny naiad is the principal submergent plant species in open water habitat in Martinez Lake and several shallow marshes.

Increasing salinity in wetlands due to high rates of evaporative water loss has decreased productivity and the functional value of existing wetlands in this management unit. Plant encroachment and succession has converted former shallow marshes to monotypic stands of exotic vegetation, and this process is ongoing in existing wetlands. Perennial streams or small channels of the Colorado River formerly flowed through the shallow marshes and into Martinez Lake, but have been closed by sedimentation and/or lowering of the main channel bottom elevation by recent flood events.

Water: Water supply and quantity is dependent on Colorado River flows, through backflow into Martinez Lake, and groundwater seepage into shallow marshes.

Wildlife Uses: Wetland habitats in this management unit provide wintering and migrational habitat for several waterfowl, waterbird, wading bird, and shorebird species. Wintering Canada geese utilize the refuge portion of Martinez Lake as a roosting area. This area also provides undisturbed habitat for wintering western grebes and white pelicans, and exposed sandbars receive heavy use by Forster's and Caspian terns, ring-billed gulls, and several shorebird species. Osprey and southern bald eagles forage in open water habitats, and peregrine falcons have been observed in the unit. Marshes provide habitat for great and snowy egrets, great blue and green-backed herons, and American and least bitterns. In 1993, 18 Yuma clapper rails were recorded in this unit. Remnant stands of willow and cottonwood provide important habitat for several resident songbird and neotropical migratory bird species. Cottonwoods and willows are also used as roosts by herons and egrets, and as they mature will provide rookery habitat. Coyote, bobcat, mule deer, and several species of small mammals, reptiles, and amphibians are present.

Public Use: Daily use, heaviest on weekends and holidays, occurs on two small riverbank "beaches" from April through October in this management unit. Activities include sunbathing, swimming, and picnicking/barbecues. Threats to resources associated with this high intensity public use include wildlife and habitat disturbance, bank erosion from watercraft wakes and vegetation trampling, litter and human waste, and human-caused wildfires. Encroachment of non-native plants, which provide few benefits for wildlife, follows wildfires. The Colorado River is a navigable waterway. Access to the main channel of the River must be allowed.

The refuge portion of Martinez Lake is closed to public entry from October 1 to March 1. Recreational fishing during the remainder of the year is a popular wildlife-oriented recreation. In 1993, a no-wake regulation was put into effect, through posting and enforcement, in the refuge portion of Martinez Lake.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(9)(10)(12)(13)(14)(15)

Strategies:

1. Following systematic site suitability analyses, restore native cottonwood, willow, and mesquite to upland sites. Utilize combination of mechanical manipulation, prescribed fire, and herbicide application to control exotic plant species to prepare and maintain revegetation sites. Determine the feasibility of using flood irrigation (simulation of short-term flood events) to promote natural reproduction of restored native plants.
2. Construct and maintain fire breaks to protect native plant stands.
3. Improve biological databases, with emphasis on avian, mammalian, amphibian, and reptilian species of concern.
4. Develop and implement a water management plan, including quantification of water use (consumptive and diversion), determination of effects of irrigation on groundwater levels and

movement, and determination of effects of fluctuating Colorado River flows on groundwater and wetland habitats.

5. Restore former wetlands using mechanical manipulation to remove stands of exotic vegetation and sediments.
6. Improve water quality and productivity in wetlands by restoring Colorado River flows through mechanical removal of vegetation and sediments in former channels.
7. Monitor water quality in wetlands, and where possible, implement water management strategies to prevent contaminant build-up.
8. Promulgate and enforce public use regulations to eliminate negative impacts of incompatible recreational activities on refuge lands.
9. Increase public awareness of refuge regulations and refuge mission through development of interpretive facilities and written materials, improved signage (including water buoys), and increased enforcement.
10. Increase fire prevention activities.

5. Martinez Marsh Management Subunit

Size: 700 acres Ownership: The site is owned by the Service.

Habitat Description: Salt cedar, giant cane, and arrowweed are the primary vegetation on upland sites (450 acres). Small remnant stands of willows and cottonwoods are also present. Wetland habitats (250 acres) comprise a sizable portion of this management subunit. Extensive stands of cattail and giant bulrush occur in shallow marshes, and along the edges of backwater lakes and former river channels. Spiny naiad is the principal submergent plant species in open water habitat in marshes and backwater lakes.

Increasing salinity in wetlands due to high rates of evaporative water loss has decreased productivity and the functional value of existing wetlands in this management subunit. Plant encroachment and succession has converted former shallow marshes to monotypic stands of exotic vegetation, and this process is ongoing in existing wetlands. Perennial streams or small river channels formerly flowed from the Colorado River through marshes and backwaters and into Martinez Lake, but have been closed by sedimentation and/or lowering of the main channel bottom elevation by recent flood events.

Levels of selenium contamination in sediments, plants, and invertebrates have been found to be lower in backwater wetlands no longer receiving direct Colorado River flows as compared to wetlands directly connected to the River. Research aimed at developing water management regimes necessary to enhance wetland productivity without increasing contaminant loads is urgently needed.

The Martinez Marsh Enhancement Project, a cooperative Service-BR habitat management project, was developed in the early 1980s to restore shallow marsh habitats and increase water quality in backwater lakes by providing Colorado River water to these wetlands through gravity flow during high water flows and pumping during low flows. The project involved dredging former river channels, construction of dikes, and installation of pumps, water control structures, and pipes. The project was initiated in 1983, but not completed. One mile of channel was dredged from Martinez Lake northward, and 2 miles of dike was constructed along the Colorado River.

Water: Water supply and quantity is dependent on Colorado River flows, through backflow into Martinez Lake and groundwater seepage into shallow marshes and backwater lakes. Water is available through secured water rights (23,000 acre-feet consumptive, 28,000 acre-feet diversion) for provision of instream flow to wetland habitats.

Wildlife Uses: Wetland habitats in this management unit provide wintering and migrational habitat for several waterfowl, waterbird, wading bird and shorebird species. Osprey and southern bald eagles forage in open water habitats, and peregrine falcons have been observed in the subunit. Marshes provide habitat for great and snowy egrets; great blue, black-crowned night, and green-backed herons; and American and least bitterns. In 1993, 16 Yuma clapper rails were recorded in this subunit. Remnant stands of willow and cottonwood provide important habitat for several resident songbird and neotropical migratory bird species. Cottonwood and willow are also used as roosts by herons and egrets, and as they mature will provide rookery habitat. Coyote, bobcat, mule deer, and several species of small mammals, reptiles, and amphibians are present. Several backwater wetlands in this management unit provide potential grow-out habitats for endangered Colorado River native fish.

Public Use: Recreational fishing occurs in McCallister and Butler lakes, but use levels have decreased in recent years due to a declining fishery. The backwater overlook road network provides access for wildlife observation in this subunit. This is a popular wildlife-oriented recreational activity from October through April.

Human-caused wildfires, primarily originating from recreational activity along the main channel of the Colorado River, is the principal threat to resources in this management subunit. Encroachment of non-native plants providing few wildlife benefits follows wildfires.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(9)(10)(12)(14)(13)(15)

Strategies:

1. Reinitiate a revised Martinez Marsh Enhancement Project through coordination with BR, University of Arizona Cooperative Wildlife Research Unit, lower Colorado River Backwaters Subcommittee, and AGFD with the following objectives:

   - Improvement of water quality and wetland productivity in existing backwaters by restoring Colorado River flows through mechanical removal of vegetation and sediments in former channels; installation of pumps, water control structures, and pipes; and dike construction.
   - Monitoring of water quality and productivity in project wetlands in order to develop water management strategies that enhance productivity while preventing contaminant build-up.
   - Restoration of former wetlands and channels using mechanical manipulation to remove stands of exotic vegetation and sediments.
   - Provision of irrigation water for native plant revegetation.
   - Provision of gravity flows to the East and West Farm Management Subunits.

2. Develop and implement a water management plan, including quantification of water use (consumptive and diversion), determination of effects of irrigation on groundwater levels and movement, and determination of effects of fluctuating Colorado River flows on groundwater and wetland habitats.
3. Improve biological databases, with emphasis on avian, mammalian, amphibian, and reptilian species of concern and vegetative community mapping.
4. Following systematic site suitability analyses, restore native cottonwood, willow, and mesquite to upland sites. Utilize combination of mechanical manipulation, prescribed fire, and herbicide application to control exotic plant species to prepare and maintain revegetation sites. Determine the feasibility of using flood irrigation (simulation of short-term flood events) to promote natural reproduction of restored native plants.

5. Construct and maintain fire breaks to protect native plant stands.
6. Develop moist soil management units on suitable sites.
7. Assess suitability of various backwater habitats for and establish native fish grow-out facility(s).
8. Enhance recreational fishing opportunities in McCallister Lake through installation of habitat structures.
9. Promulgate and enforce public use regulations to eliminate negative impacts of incompatible recreational activities on refuge lands.
10. Increase public awareness of Refuge regulations and purposes through development of interpretive facilities and written materials, improved signage (including water buoys), and increased enforcement.
11. Increase fire prevention activities.

6. Ferguson Lake and Shore Management Unit

Size: 750 acres Ownership: The site is owned by the Service. The BLM administers lands south of the refuge that include developed camping facilities.

Habitat Description: Ferguson Lake historically received direct flows from the Colorado River through a series of channels. Recent flood events closed entrance channels through sedimentation and lowering of the main river channel bottom elevation. The lake remains connected to the Colorado River via a single channel at its southern end, and water levels in Ferguson Lake are dependent on backflow from the River. The refuge portion of Ferguson Lake is comprised of open water habitat and interconnected backwater marshes. Cattail and giant bulrush are the predominant emergents; spiny naiad is the principal submergent. Increasing salinity in wetlands due to high rates of evaporative water loss has decreased productivity and the functional value of existing wetlands in this management unit. Plant encroachment and succession has converted former shallow marshes to monotypic stands of exotic vegetation, and this process is ongoing in existing wetlands. Salt cedar and giant cane dominate on upland sites. Remnant stands of cottonwood, willow, and honey and screwbean mesquite are also present.

Water: Water supply and quantity is dependent on Colorado River flows, through backflow into Ferguson Lake and groundwater seepage into shallow marshes and backwater lakes. No secured water rights are available for the California portion of the Refuge.

Wildlife Use: Wetland habitats in this management unit provide wintering and migrational habitat for several waterfowl, waterbird, wading bird, and shorebird species. This area also provides undisturbed habitat for wintering western grebes and white pelicans, and exposed sandbars receive heavy use by Forster's and Caspian terns and ring-billed gulls. Osprey and southern bald eagles forage in open water habitats, and peregrine falcons have been observed in the unit. Marshes provide habitat for great and snowy egrets, great blue black-crowned night and green-backed herons, and American and least bitterns. In 1993, 18 Yuma clapper rails were recorded in this portion of the Refuge. In addition, one California black rail responded to clapper rail call-back tapes. Remnant stands of willow and cottonwood provide important habitat for several resident songbird and neotropical migratory bird species. Cottonwoods and willows are also used as roosts by herons and egrets, and as they mature will provide rookery habitat. Coyote, bobcat, mule deer and several species of small mammals, reptiles, and amphibians are present.

Public Use: Ferguson Lake receives high levels of recreational boating and associated uses from April through October. Recreational fishing is a popular activity on the refuge portion of the lake. Some wildlife observation while boating also occurs. The refuge portion of Ferguson Lake is a designated no-wake zone and is closed to public entry from October 1 to March 1 to provide undisturbed habitat for wintering migratory birds.

Human-caused wildfires associated with recreational activities in and along Ferguson Lake and the Colorado River are the principal threat to resources in this management unit. Encroachment of non-native plants, which provide few benefits for wildlife follows wildfires. Illegal boating, including personal watercraft use, occurs during high water periods on the Refuge. Illegal off-road vehicle activity occurs on upland sites.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(9)(10)(12)(13)(14)(15)

Strategies:

1. Initiate an Upper Ferguson Lake Enhancement Project through coordination with BR, University of Arizona Cooperative Wildlife Research Unit, Lower Colorado River Backwaters Subcommittee, and CDFG, with the following objectives:

   - Improvement of water quality and wetland productivity in existing backwaters by restoring Colorado River flows through mechanical removal of vegetation and sediments in former channels; possibly installation of pumps, water control structures, and pipes; and dike construction.
   - Monitoring of water quality and productivity in project wetlands and Ferguson Lake in order to develop water management strategies that enhance productivity while preventing contaminant build-up.
   - Restoration of former wetlands and channels using mechanical manipulation to remove stands of exotic vegetation and sediments.
   - Provision of irrigation water for native plant revegetation.
   - Water and/or instream flow rights must be secured for this project.

2. Develop and implement a water management plan, including quantification of water use (consumptive and diversion), determination of effects of irrigation on groundwater levels and movement, and determination of effects of fluctuating Colorado River flows on groundwater and wetland habitats.
3. Improve biological databases, with emphasis on avian, mammalian, amphibian, and reptilian species of concern.
4. Following systematic site suitability analyses, restore native cottonwood, willow, and mesquite to upland sites. Utilize combination of mechanical manipulation, prescribed fire, and herbicide application to control exotic plant species to prepare and maintain revegetation sites. Determine the feasibility of using flood irrigation (simulation of short-term flood events) to promote natural reproduction of restored native plants.
5. Construct and maintain fire breaks to protect native plant stands.
6. Develop moist soil management units on suitable sites.
7. Assess suitability of various backwater habitats for and establish native fish grow-out facility(s).
8. Promulgate and enforce public use regulations to eliminate negative impacts of incompatible recreational activities on refuge lands.
9. Increase public awareness of refuge regulations and purposes through development of interpretive facilities and written materials, improved signage (including water buoys), and increased enforcement.
10. Increase fire prevention activities.

7. and 8. Backwater/Riveredge Management Unit

Size: Arizona - 2,989 acres; California - 2,620 acres.

Ownership: All backwater/riveredge habitats are owned by the Service.

Habitat Description: This management unit includes a system of backwater wetlands extending along 24 and 14 miles of the Colorado River on the Arizona and California sides, respectively. This series of wetlands is a unique feature of Imperial NWR within the Area of Ecological Concern, and is singular in importance to maintenance of biodiversity on the Refuge.

The system contains open water habitat in larger wetlands and shallow and deep marshes. Cattail and giant bulrush are the predominant emergents; spiny naiad is the principal submergent. Salt cedar and giant cane dominate on upland sites. Remnant stands of cottonwood, willow, and honey and screwbean mesquite are also present.

Recent flood events and sedimentation have closed channels from the Colorado River into several backwater wetlands in this system. Increasing salinity in wetlands no longer receiving flows, due to high rates of evaporative water loss, has decreased productivity and the functional value of these wetlands. Plant encroachment and succession has converted former shallow marshes to monotypic stands of exotic vegetation, and this process is ongoing in existing wetlands.

Wildlife Use: Wetland habitats in this management unit provide wintering and migrational habitat for several waterfowl, waterbird, and wading bird species. This area also provides undisturbed habitat for wintering western grebes and white pelicans, and exposed sandbars receive heavy use by Forster's and Caspian terns, ring-billed gulls, and several shorebird species. Most wintering southern bald eagles on the Refuge are found in this management unit. Osprey forage in open water habitats, and peregrine falcons have been observed. Marshes provide habitat for great and snowy egrets; great blue, black-crowned night, and green-backed herons; and American and least bitterns. In 1993, 65 Yuma clapper rails were recorded in this portion of the refuge. Remnant stands of willow and cottonwood provide important habitat for several resident songbird and neotropical migratory bird species. Cottonwood and willow are also used as roosts by herons and egrets. As the trees mature, they will provide rookery habitat. One mature stand of willows, north of Island Lake, currently supports a heron rookery. Coyote, bobcat, Yuma puma, desert bighorn sheep, mule deer, feral burros and horses, and several species of small mammals, reptiles and amphibians are present.

Public Use: The Colorado River receives high levels of recreational boating and associated uses from April through October. "Beach use" of sandbars and sandy river bank areas include sunbathing, swimming, picnicking/barbecues and associated activities. Recreational fishing, waterfowl hunting and wildlife observation are popular wildlife-oriented activities on the Colorado River and backwater wetlands accessible from the River. All backwater wetlands on the Refuge are designated No Wake zones.

Threats to resources associated with this high intensity public use include wildlife and habitat disturbance, bank erosion from watercraft wakes and vegetation trampling, litter and human waste, and human-caused wildfires. Encroachment of non-native plants, which provide few benefits for wildlife, follows wildfires. Illegal boating, primarily personal watercraft use, occurs during high water periods in accessible backwaters. Illegal camping occurs along the Colorado River, and illegal off-road vehicle activity occurs on upland sites. The Colorado River is a navigable waterway; access through the main River channel must be allowed.

CMP Goals: (1)(2)(3)(4)(5)(6)(7)(8)(9)(10)(12)(13)(14)(15)

Strategies:

1. Develop and implement a Backwaters Management Plan through coordination with BR, University of Arizona Cooperative Wildlife Research Unit, Lower Colorado River Backwaters Subcommittee, AGFD, and CDFG with the following objectives:

- Maintenance of backwater wetland habitats in variety of successional stages to restore and enhance biodiversity.
- Improvement of water quality and wetland productivity in project backwaters by restoring Colorado River flows through mechanical removal of vegetation and sediments in former channels, and potential installation of water control structures and dikes.
- Monitoring of water quality and productivity in project wetlands in order to develop water management strategies that enhance productivity while preventing contaminant build-up.
- Restoration of former wetlands and channels using mechanical manipulation to remove stands of exotic vegetation and sediments.
- Provision of irrigation water for native plant revegetation.
- Water and/or instream flow rights must be secured for backwater enhancements in California.

2. Develop and implement a water management plan, including quantification of water use (consumptive and diversion), determination of effects of irrigation on groundwater levels and movement, and determination of effects of fluctuating Colorado River flows on groundwater and wetland habitats.
3. Improve biological databases, with emphasis on avian, mammalian, amphibian, and reptilian species of concern.
4. Following systematic site suitability analyses, restore native cottonwood, willow, and mesquite to upland sites. Utilize combination of mechanical manipulation, prescribed fire, and herbicide application to control exotic plant species to prepare and maintain revegetation sites. Determine the feasibility of using flood irrigation (simulation of short-term flood events) to promote natural reproduction of restored native plants.
5. Construct and maintain fire breaks to protect native plant stands.
6. Assess suitability of various backwater habitats for and establish native fish grow-out facility(s) and/or exclusive habitat for native fish.
7. Improve access to selected backwaters for recreational fishing and other wildlife-oriented recreational activities.
8. Promulgate and enforce public use regulations to eliminate negative impacts of incompatible recreational activities on refuge lands.
9. Increase public awareness of refuge regulations and purposes through development of interpretive facilities and written materials, improved signage (including water buoys), and increased enforcement.
10. Increase fire prevention activities.

9. Wilderness Management Unit

Size: Arizona - 9,220 acres (designated Wilderness); California - 5,836 (proposed Wilderness) plus 1,000 acres buffer

Ownership: The unit is owned by the Service. The site includes the 9,220-acre Imperial wilderness area, designated by the Arizona Wilderness Act of 1990, and 5,836 acres of proposed Wilderness in California, currently being considered for designation by Congress under the California Desert Protection Act.

Habitat Description: This management unit is comprised of Sonoran Desert upland habitats, including mountainous terrain reaching 3,200 feet in elevation and several desert washes. The dominant plant association in desert uplands is creosote bush-white bursage. Other plant species include numerous ephemerals, eight species of cacti, and ocotillo. Tree species found in the washes are microphyllous and

include honey mesquite, ironwood, palo verde, and smoketree. Understory plants in the washes include cat claw acacia, burrobrush, desert broom, desert willow, chuparosa, and desert honeysuckle.

Wildlife Use: Desert washes provide important nesting and wintering habitat for several passerine species, including northern gilded flicker, Gila woodpecker, phainopepla, verdin, and ash-throated and brown-crested flycatcher. Raptors including peregrine falcon, prairie falcon, Harris hawk, Cooper's hawk, sharpshinned hawk, red-tailed hawk, burrowing owl, and great-horned owl utilize desert habitats. Yuma puma, coyote, bobcat, ring-tailed cat, gray, and kit fox and several species of small mammals are present. At least two sensitive bat species, the Arizona cave myotis and California leaf-nosed bat are known to occur in caves and abandoned mine shafts on the Refuge. A wide array of desert-dwelling reptiles, including several species of concern such as the Sonoran desert tortoise, chuckwalla, Gila monster, and rosy boa are present.

Public Use: Public uses in this management unit include upland and big game hunting and wildlife observation.

Human-caused wildfires originating from recreational activities along the Colorado River and burning into desert washes are a threat to native habitats. Illegal off-road vehicle activity occurs throughout the unit. Human disturbance to roosts and maternity colonies of sensitive bat species occurs at mine shafts and caves accessible from the Colorado River.

CMP Goals: (1)(2)(10)(12)(13)(14)(15)

Strategies:

1. Improve biological databases, with emphasis on avian, mammalian, and reptilian species of concern and vegetative community mapping.
2. Coordinate with Arizona and California wildlife agencies to conduct a complete inventory of Refuge mine shafts and caves for development of management recommendations to protect sensitive bat species.
3. Increase public awareness of Refuge regulations and purposes through development of interpretive facilities and written materials, improved signage, and increased enforcement.
4. Increase fire prevention activities.

Lower Colorado River Refuges Secondary Uses
Public Use Activity Maps 10, 11, 12, 13, 14

Secondary Uses not Planned to Occur on the Refuges[68]

The following Secondary Uses are listed as "not planned to occur" at any of the Lower Colorado River National Wildlife Refuges because they do not conform to uses which could be, in a regulated manner, "compatible" with the purposes of the refuges, or they have been determined to be harmful to refuge resources.

1. Commercial Fishing
2. Recreational Trapping
3. Commercial Trapping
4. Camping[69]
5. Off-road Vehicles
6. Airboats[70]
7. Water skiing[70]
8. Beach Use/Swimming[70]
9. Grazing
10. Haying
11. Timber Harvest
12. Mineral Exploration
13. Mining
14. Oil/Gas Exploration
15. Oil/Gas Extraction
16. Rental of Facilities
17. Military Ground Exercises
18. Billboards
19. Fishing Derbies

---

[68]These uses as listed are extracted from the 1990 Report to the Director entitled ***Secondary Uses Occurring On National Wildlife Refuges.*** They are not proposed or planned to be conducted by the Service within the Lower Colorado River National Wildlife Refuge Complex. Uses that occur on the mainstem Colorado River and are known to be harmful to refuge resources will be regulated in coordination with the AGFD.

[69]Camping at Five Mile Landing concession (Havasu NWR) is one of the uses provided for by the concessionaire in accordance with a long term lease which will not expire until 2006. The Colorado River National Wildlife Refuges Comprehensive Management Plan (CMP) calls for the manager of Havasu NWR to determine the compatibility of the current uses provided for by the agreement and develop options 10 years in advance of expiration so that the Service may decide whether to renew, terminate, or adjust the scope of uses at the site. Please refer to Goal #10: Compatibility and Refuge Allowable Uses, Objective (6) and (7); and Goal #11: Land Status and Jurisdiction, Objective (7). Pages 57 - 58 of this Environmental Assessment or pages 148 - 150 of the CMP document.

[70]While the Service has the authority to regulate and control activities on waterways under which the Service owns subsurface lands, it may not have the authority to ban these kinds of uses from the main Colorado River channel. The Lower Colorado River National Wildlife Refuges CMP calls for the clarification of these jurisdictional authorities under Goal #11: Land Status and Jurisdiction, Objective (5). (Please refer to page 58 of this EA.) The refuge managers will continue to work closely with the appropriate State authorities with respect to the impacts of these kinds of uses on refuge wildlife resources. The refuge managers will monitor these uses when they occur so as to empirically establish relationships between the use and impacts to resources. When such impacts are established, the managers should work with State authorities to regulate and control such uses in order to deter future impacts.

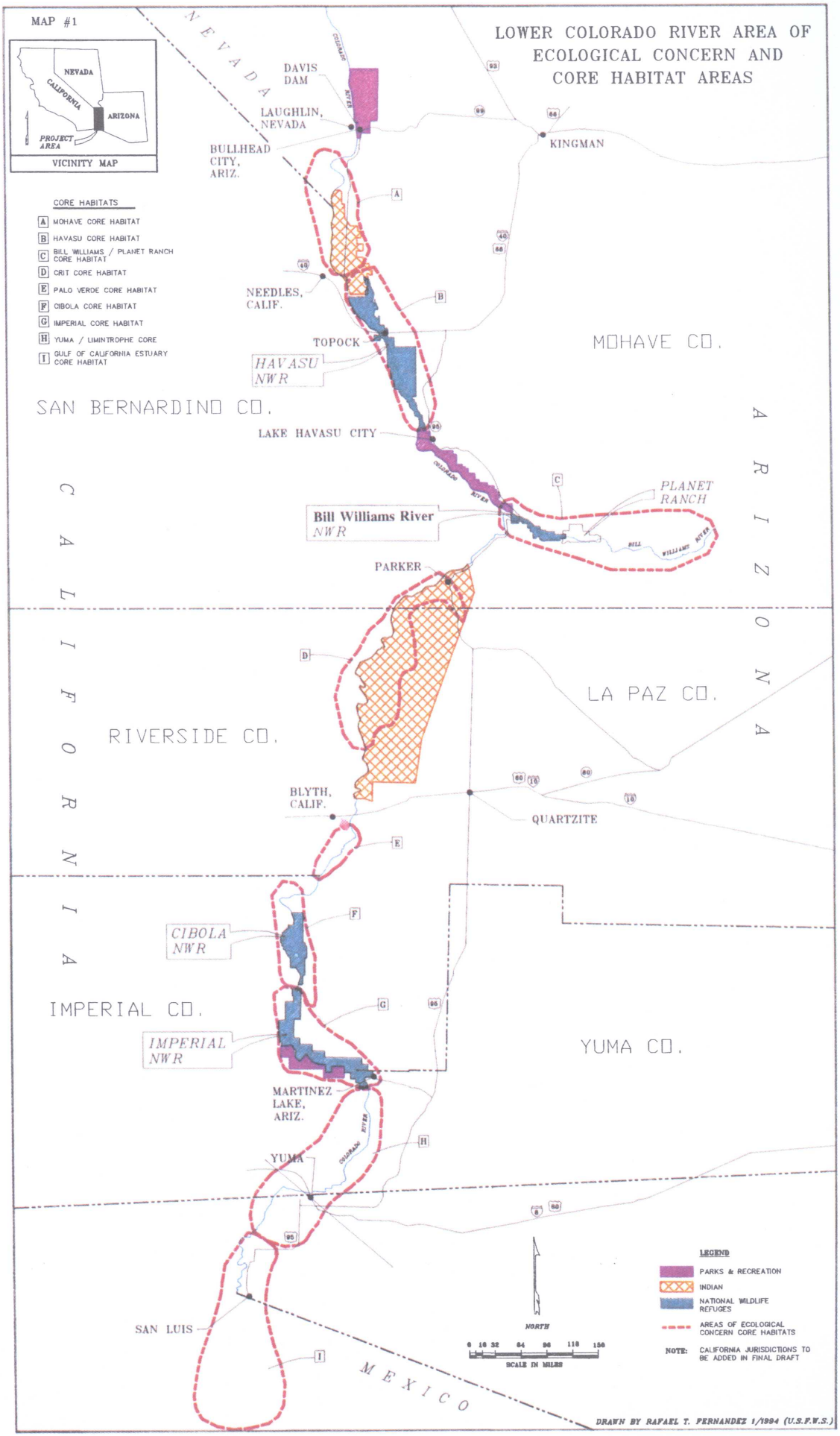
20. Geothermal Exploration
21. Jogging Trails
22. Model Airplane/Kite Flying
23. Rock Hounding
24. Jet Skiing[70]
25. Technical Rock Climbing

Secondary Uses that May Occur Within the Lower Colorado River Refuge Complex

Subject to site-specific annual compatibility review and Refuge Recreation Act funding analysis. The following are uses that could possibly be regulated creating conditions under which they might be compatible with the refuges purposes and the goals of the refuge system.

1. Wildlife Trails (non-motorized)
2. Wildlife Tour Routes (motorized)
3. Interpretive Center
4. Visitor Contact Station
5. Interpretive Exhibits
6. Environmental Education
7. Wildlife Observation
8. Photography
9. Walking/Hiking
10. Waterfowl Hunting
11. Other Migratory Bird Hunting
12. Upland Game Bird Hunting
13. Big Game Hunting
14. Small Game Hunting
15. Recreational Fishing
16. Boating (non-motorized)
17. Boating (motorized)
18. Horseback Riding
19. Field Trials
20. Beekeeping
21. Rights-of-Way (as proposed)
22. Bicycling (Refuge Roads)
23. Concessions[71]
24. Research
25. Guided Tours
26. Cooperative Farming

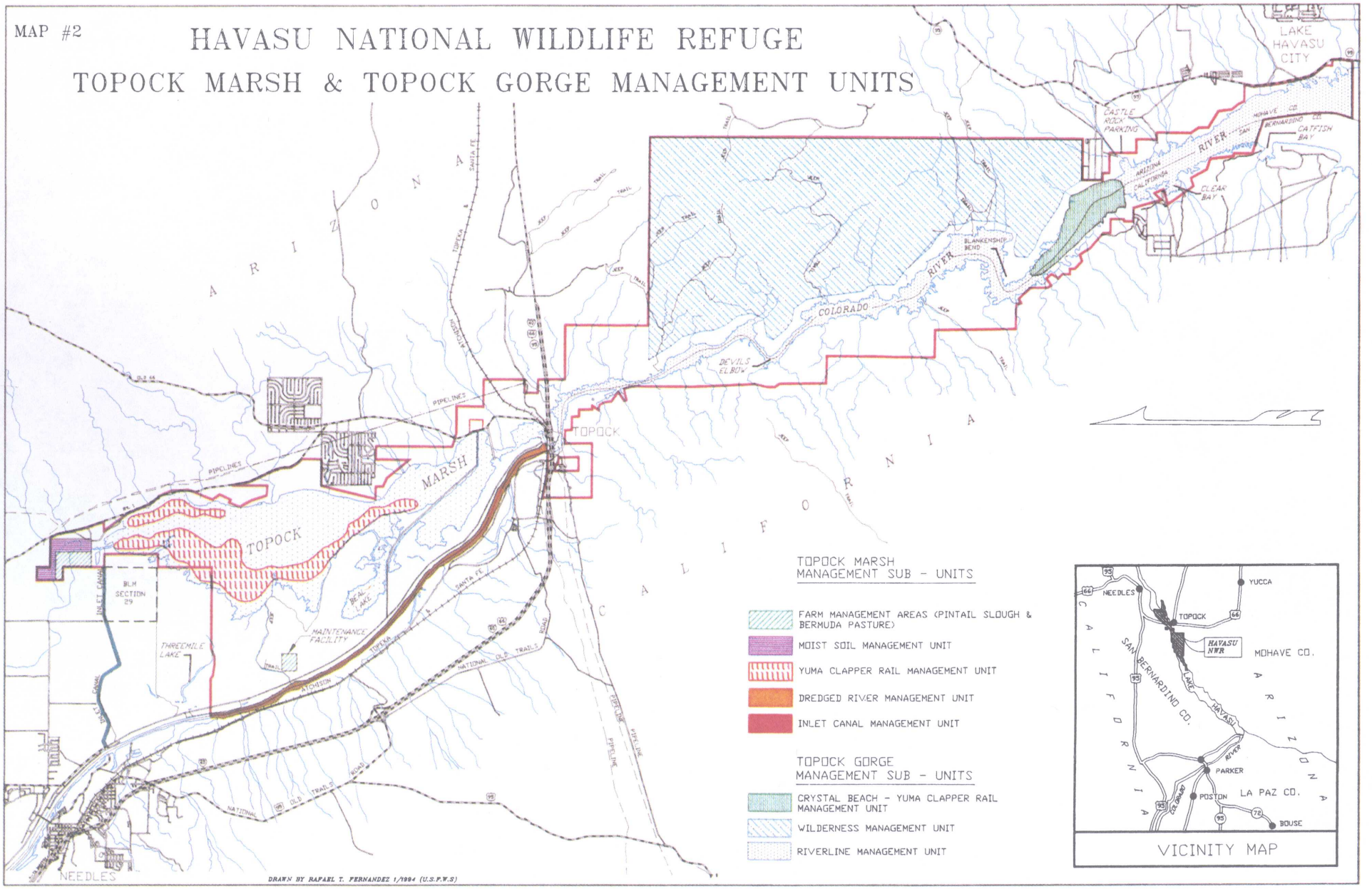
[71]Please refer to Goal #10 Compatibility and Refuge Allowable Uses, Objectives 6 and 7.


MAP #1
LOWER COLORADO RIVER AREA OF ECOLOGICAL CONCERN AND CORE HABITAT AREAS
NEVADA
CALIFORNIA
ARIZONA
PROJECT AREA
VICINITY MAP
CORE HABITATS
A MOHAVE CORE HABITAT
B HAVASU CORE HABITAT
C BILL WILLIAMS / PLANET RANCH CORE HABITAT
D CRIT CORE HABITAT
E PALO VERDE CORE HABITAT
F CIBOLA CORE HABITAT
G IMPERIAL CORE HABITAT
H YUMA / LIMINTROPHE CORE
I GULF OF CALIFORNIA ESTUARY CORE HABITAT
NEVADA
DAVIS DAM
LAUGHLIN, NEVADA
BULLHEAD CITY, ARIZ.
KINGMAN
NEEDLES, CALIF.
TOPOCK
HAVASU NWR
MOHAVE CO.
SAN BERNARDINO CO.
LAKE HAVASU CITY
PLANET RANCH
Bill Williams River NWR
PARKER
ARIZONA
CALIFORNIA
RIVERSIDE CO.
LA PAZ CO.
BLYTH, CALIF.
QUARTZITE
CIBOLA NWR
IMPERIAL CO.
IMPERIAL NWR
YUMA CO.
MARTINEZ LAKE, ARIZ.
YUMA
SAN LUIS
MEXICO
NORTH
0 16 32 64 96 118 150
SCALE IN MILES
LEGEND
PARKS & RECREATION
INDIAN
NATIONAL WILDLIFE REFUGES
AREAS OF ECOLOGICAL CONCERN CORE HABITATS
NOTE: CALIFORNIA JURISDICTIONS TO BE ADDED IN FINAL DRAFT
DRAWN BY RAFAEL T. FERNANDEZ 1/1994 (U.S.F.W.S.)

MAP #2

HAVASU NATIONAL WILDLIFE REFUGE

TOPOCK MARSH & TOPOCK GORGE MANAGEMENT UNITS



TOPOCK MARSH
MANAGEMENT SUB - UNITS

- FARM MANAGEMENT AREAS (PINTAIL SLOUGH & BERMUDA PASTURE)
- MOIST SOIL MANAGEMENT UNIT
- YUMA CLAPPER RAIL MANAGEMENT UNIT
- DREDGED RIVER MANAGEMENT UNIT
- INLET CANAL MANAGEMENT UNIT

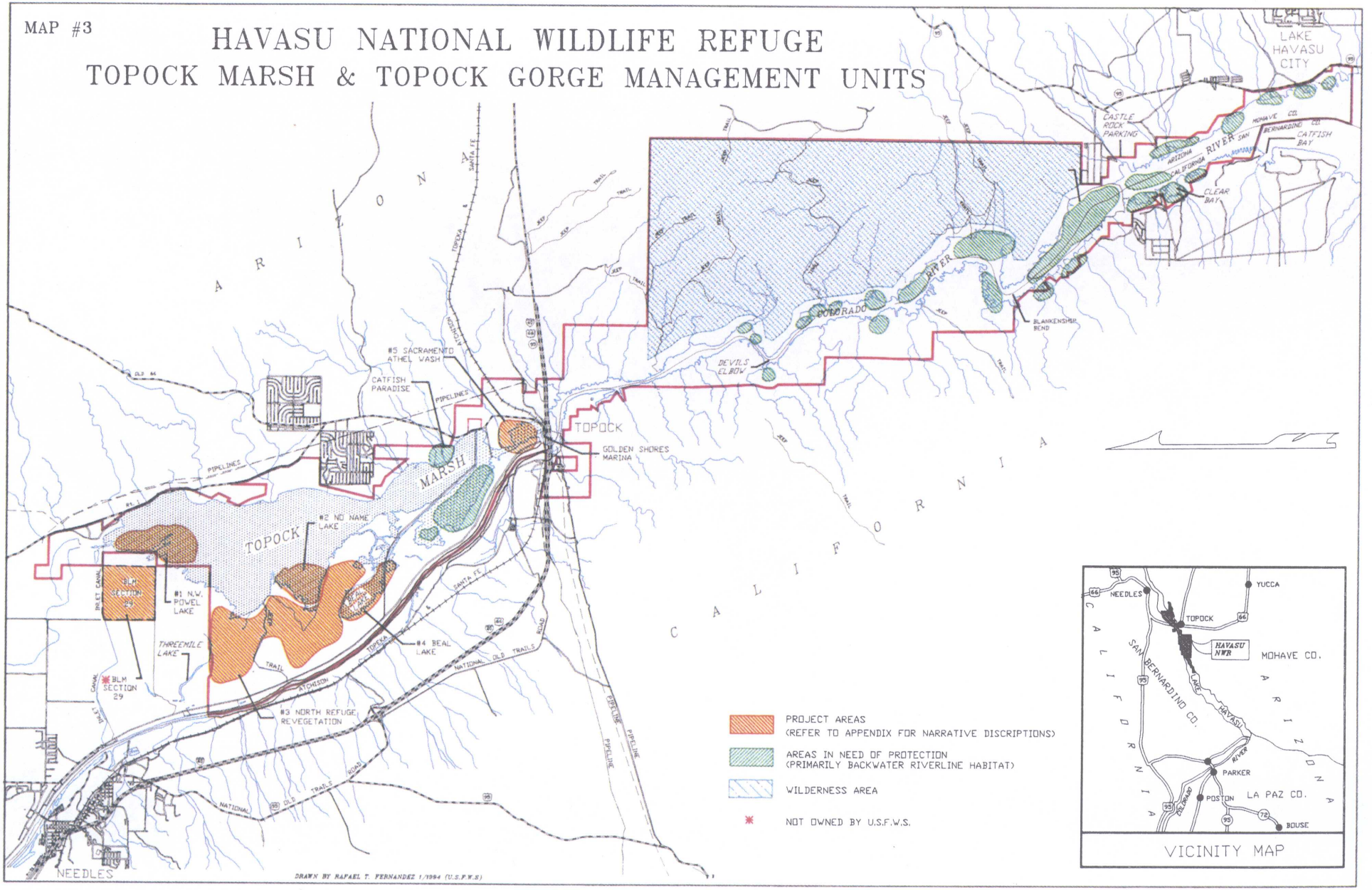
TOPOCK GORGE
MANAGEMENT SUB - UNITS

- CRYSTAL BEACH - YUMA CLAPPER RAIL MANAGEMENT UNIT
- WILDERNESS MANAGEMENT UNIT
- RIVERLINE MANAGEMENT UNIT

VICINITY MAP

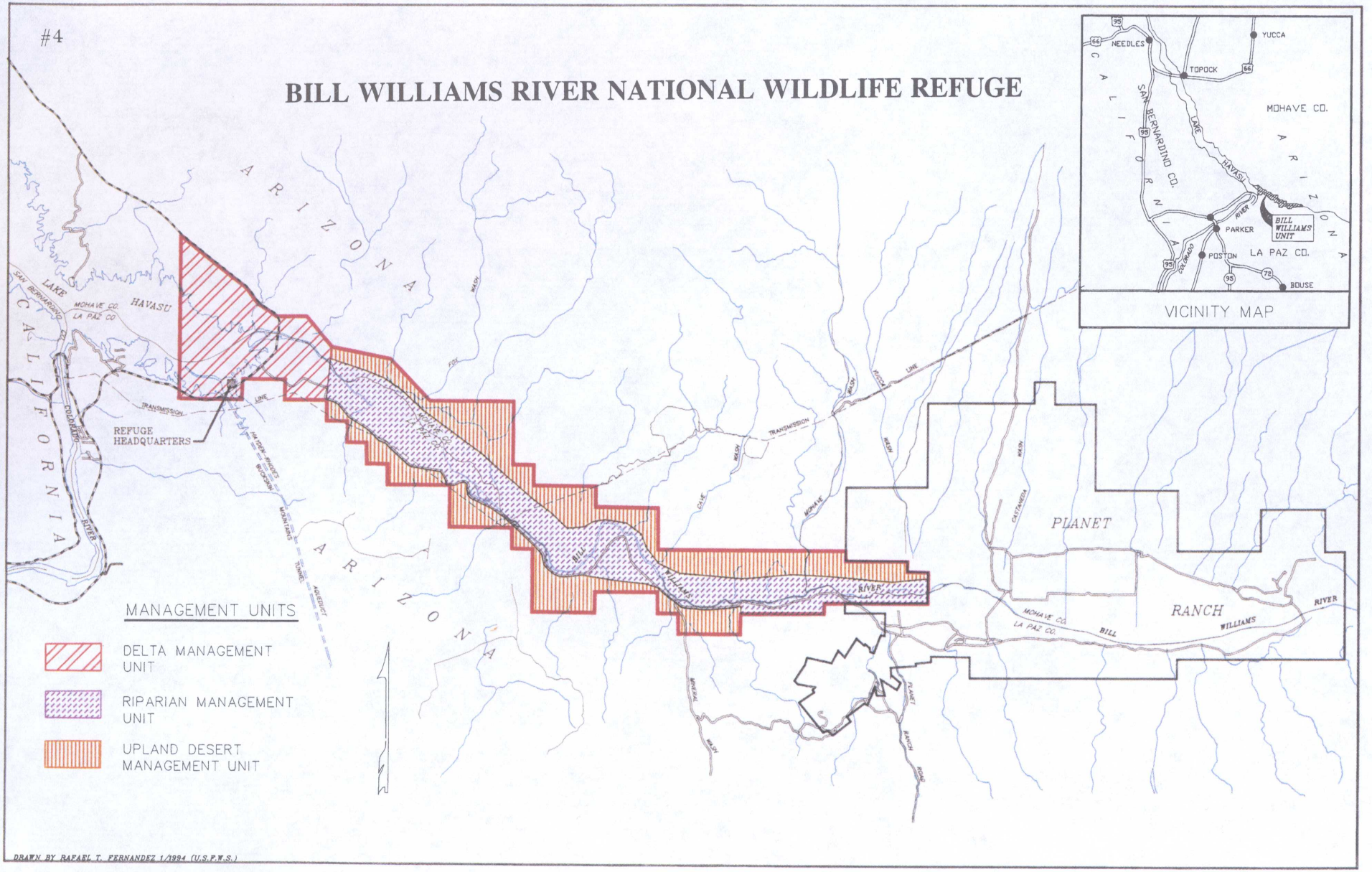
MAP #3

HAVASU NATIONAL WILDLIFE REFUGE
TOPOCK MARSH & TOPOCK GORGE MANAGEMENT UNITS



#4

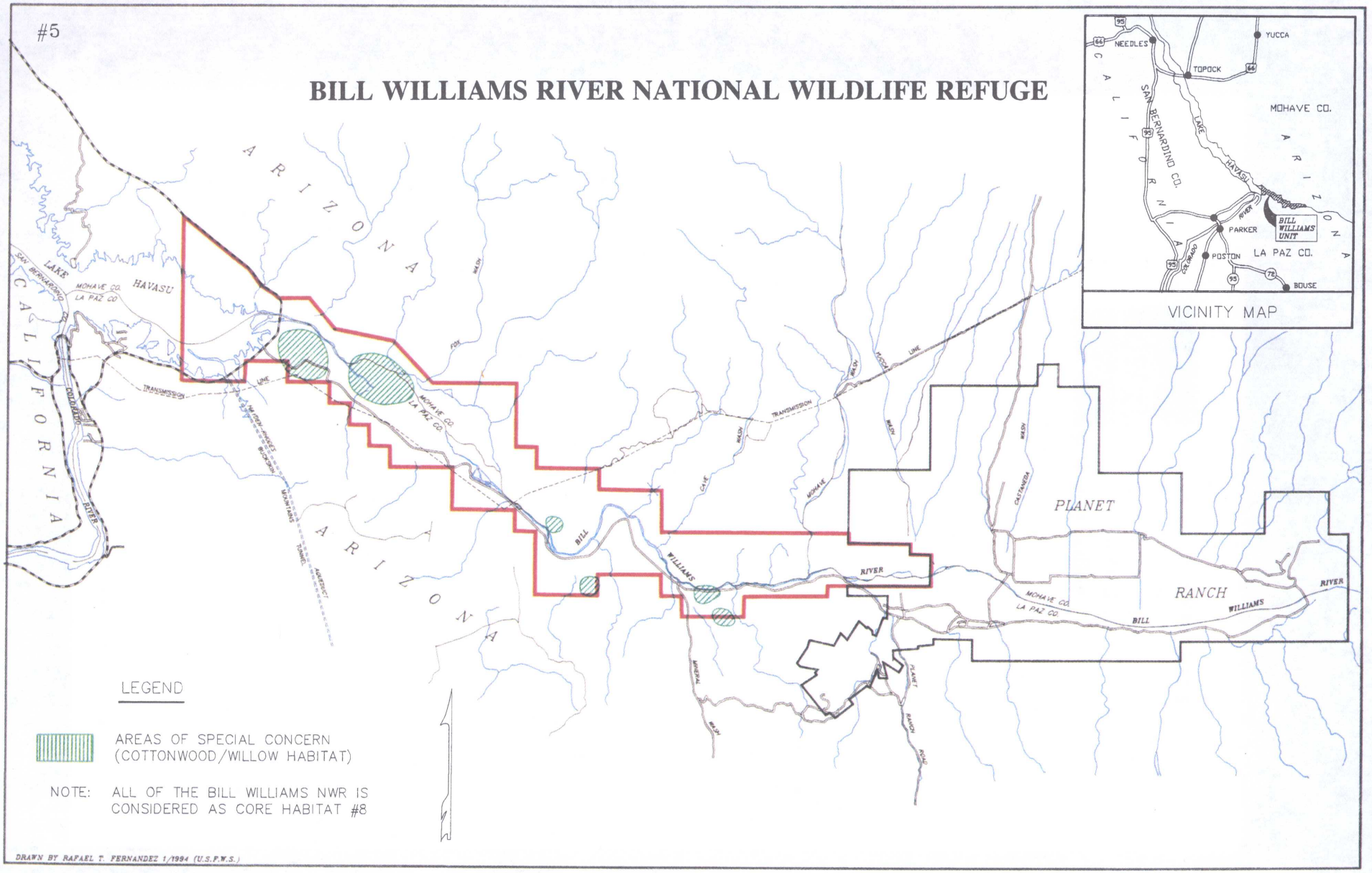
BILL WILLIAMS RIVER NATIONAL WILDLIFE REFUGE



DRAWN BY RAFAEL T. FERNANDEZ 1/1994 (U.S.F.W.S.)

#5

BILL WILLIAMS RIVER NATIONAL WILDLIFE REFUGE



LEGEND

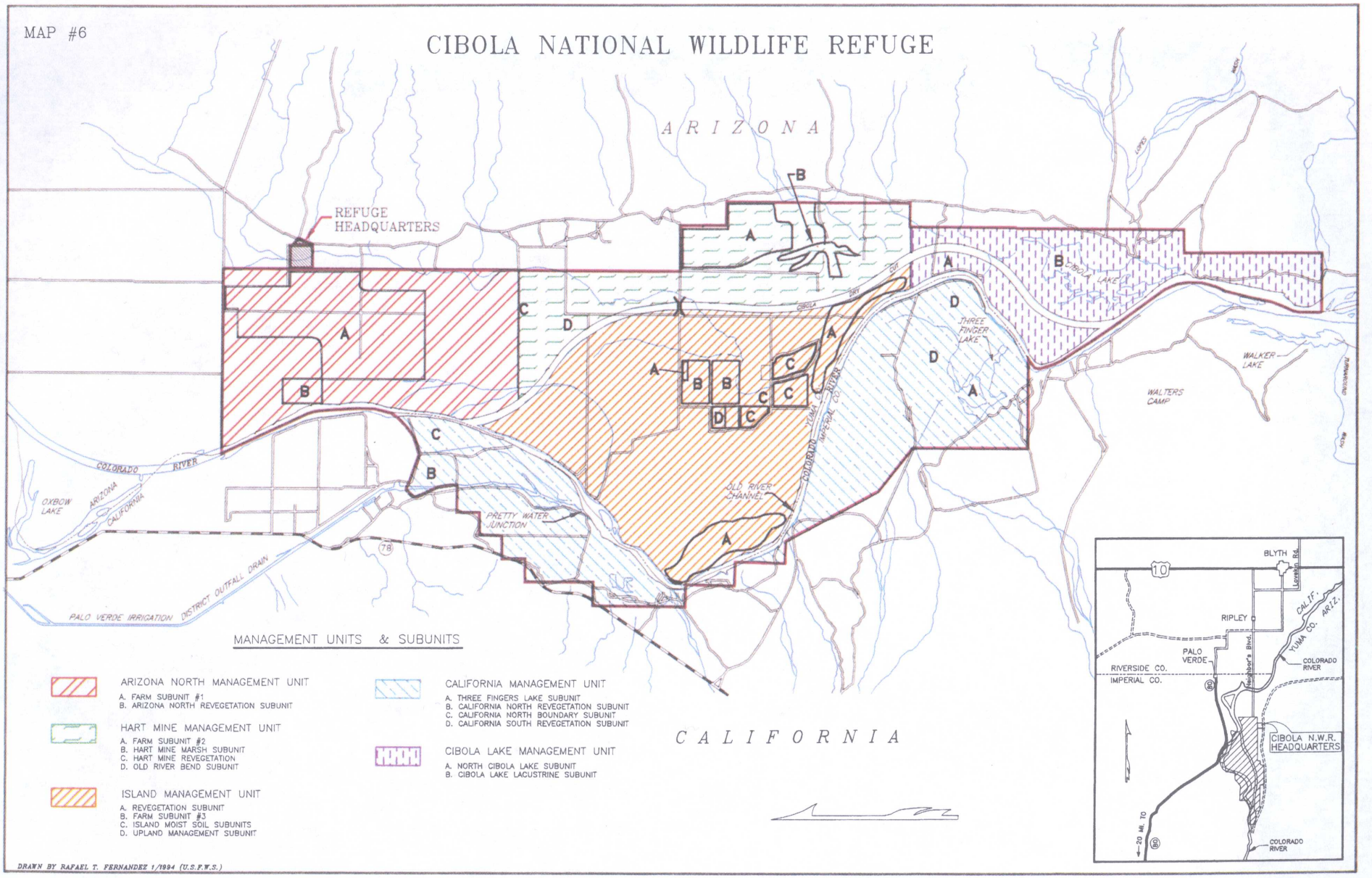
AREAS OF SPECIAL CONCERN (COTTONWOOD/WILLOW HABITAT)

NOTE: ALL OF THE BILL WILLIAMS NWR IS CONSIDERED AS CORE HABITAT #8

DRAWN BY RAFAEL T. FERNANDEZ 1/1994 (U.S.F.W.S.)

MAP #6

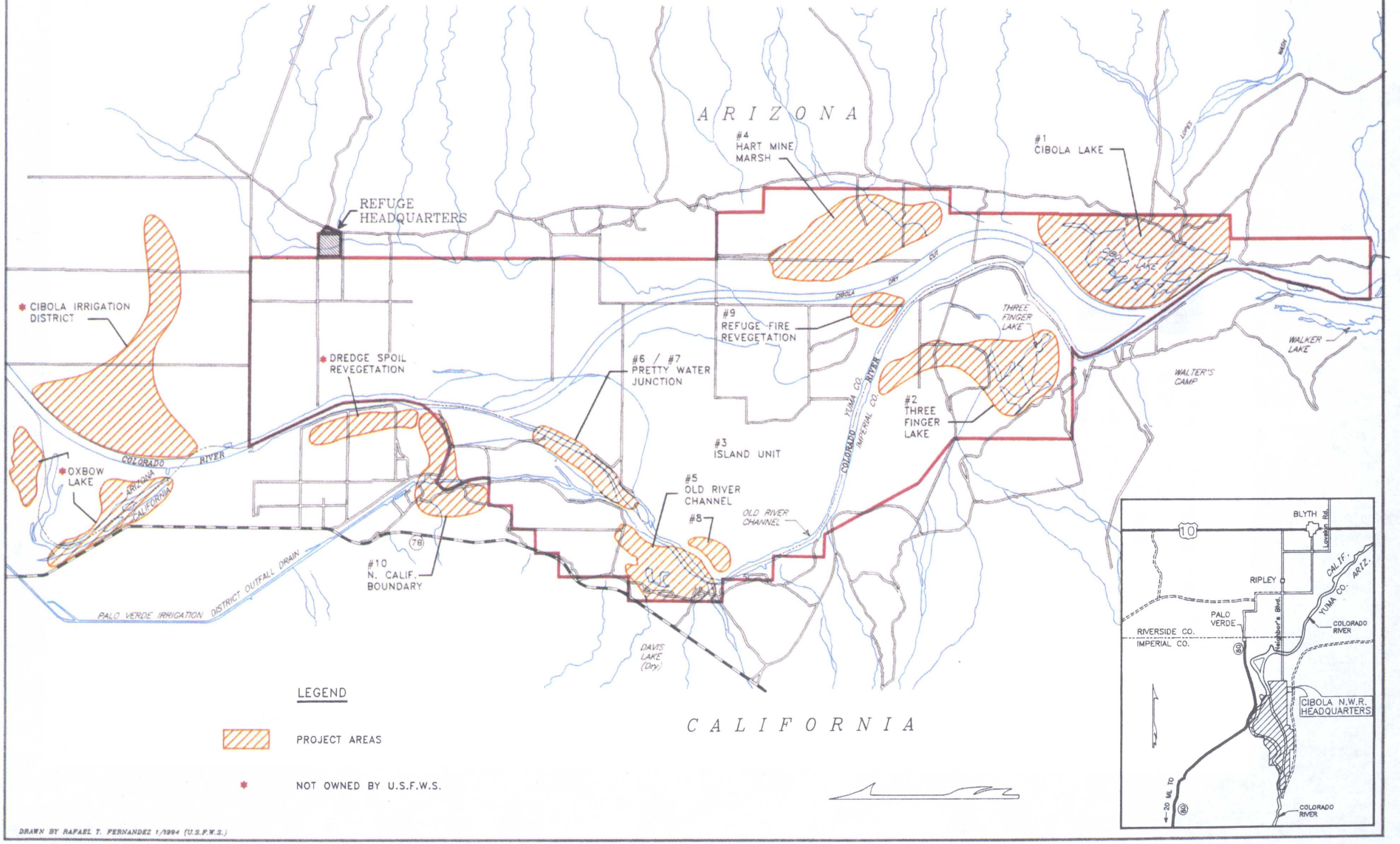
CIBOLA NATIONAL WILDLIFE REFUGE



DRAWN BY RAFAEL T. FERNANDEZ 1/1994 (U.S.F.W.S.)

MAP #7

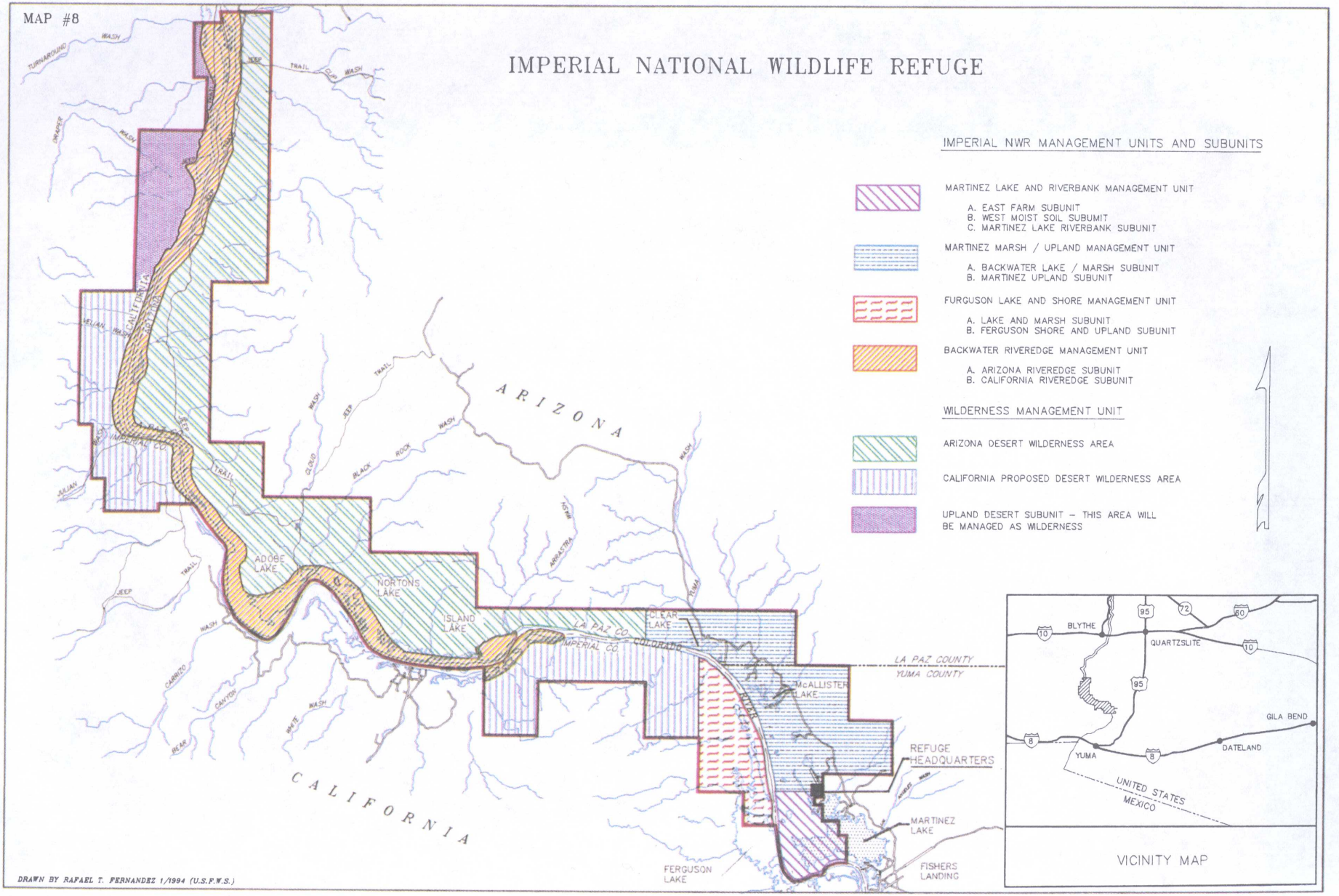
CIBOLA NATIONAL WILDLIFE REFUGE



DRAWN BY RAFAEL T. FERNANDEZ 1/1994 (U.S.F.W.S.)

MAP #8

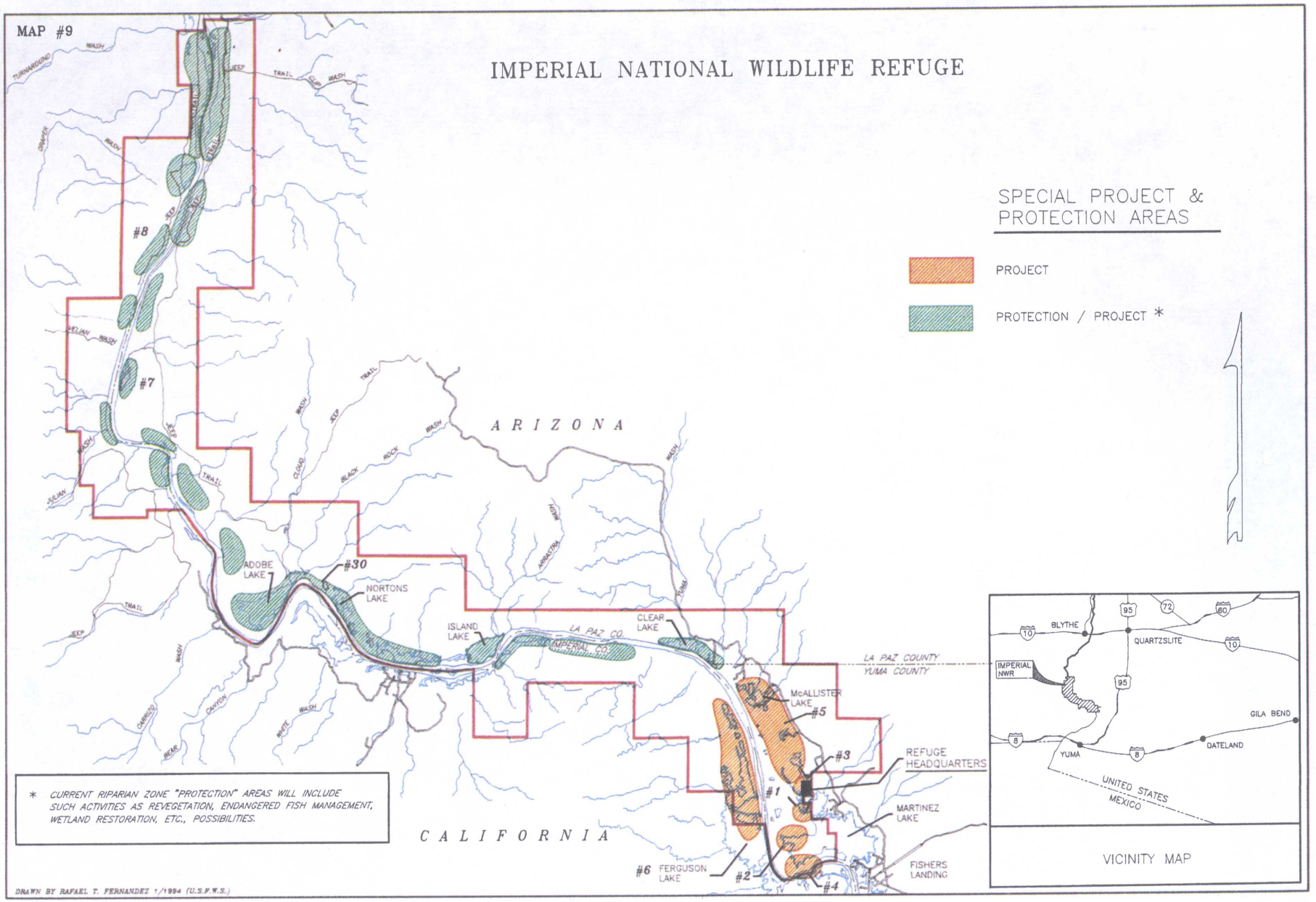
IMPERIAL NATIONAL WILDLIFE REFUGE



DRAWN BY RAFAEL T. FERNANDEZ 1/1994 (U.S.F.W.S.)

MAP #9

IMPERIAL NATIONAL WILDLIFE REFUGE

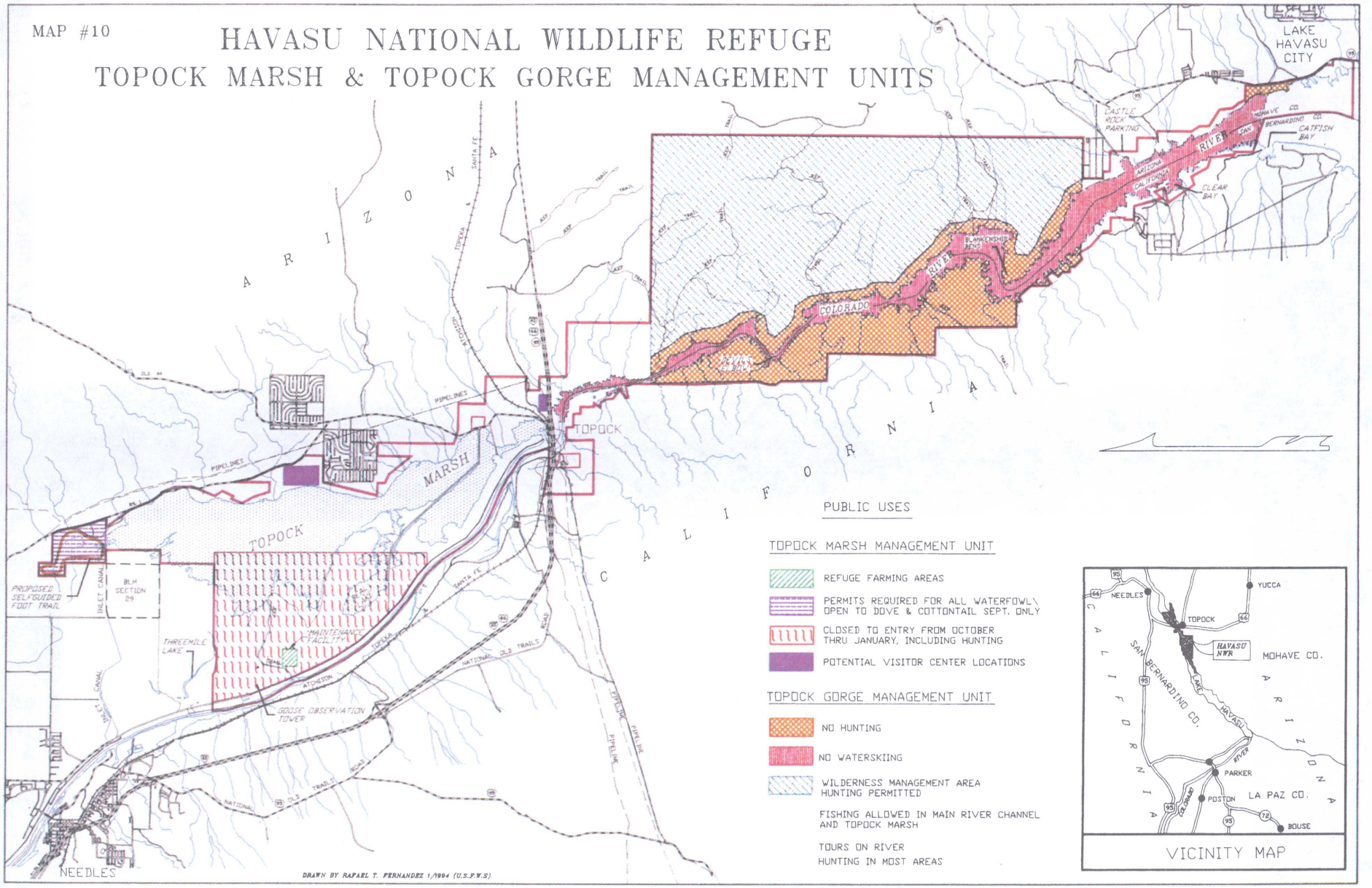


DRAWN BY RAFAEL T. FERNANDEZ 1/1994 (U.S.F.W.S.)

MAP #10

HAVASU NATIONAL WILDLIFE REFUGE

TOPOCK MARSH & TOPOCK GORGE MANAGEMENT UNITS



PUBLIC USES

TOPOCK MARSH MANAGEMENT UNIT

- REFUGE FARMING AREAS
- PERMITS REQUIRED FOR ALL WATERFOWL\ OPEN TO DOVE & COTTONTAIL SEPT. ONLY
- CLOSED TO ENTRY FROM OCTOBER THRU JANUARY, INCLUDING HUNTING
- POTENTIAL VISITOR CENTER LOCATIONS

TOPOCK GORGE MANAGEMENT UNIT

- NO HUNTING
- NO WATERSKIING
- WILDERNESS MANAGEMENT AREA HUNTING PERMITTED

FISHING ALLOWED IN MAIN RIVER CHANNEL AND TOPOCK MARSH

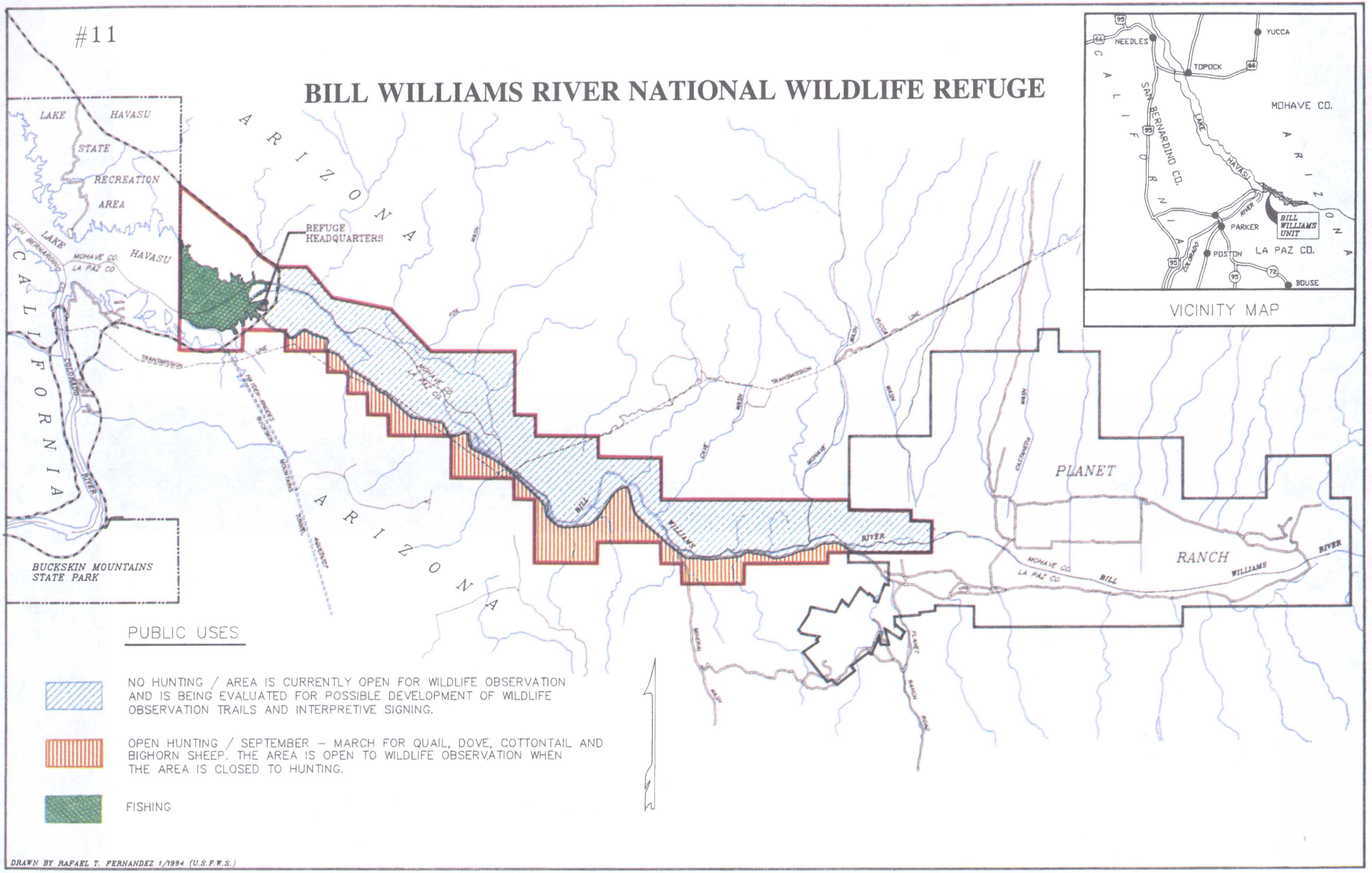
TOURS ON RIVER

HUNTING IN MOST AREAS

VICINITY MAP

#11

BILL WILLIAMS RIVER NATIONAL WILDLIFE REFUGE



PUBLIC USES

NO HUNTING / AREA IS CURRENTLY OPEN FOR WILDLIFE OBSERVATION AND IS BEING EVALUATED FOR POSSIBLE DEVELOPMENT OF WILDLIFE OBSERVATION TRAILS AND INTERPRETIVE SIGNING.

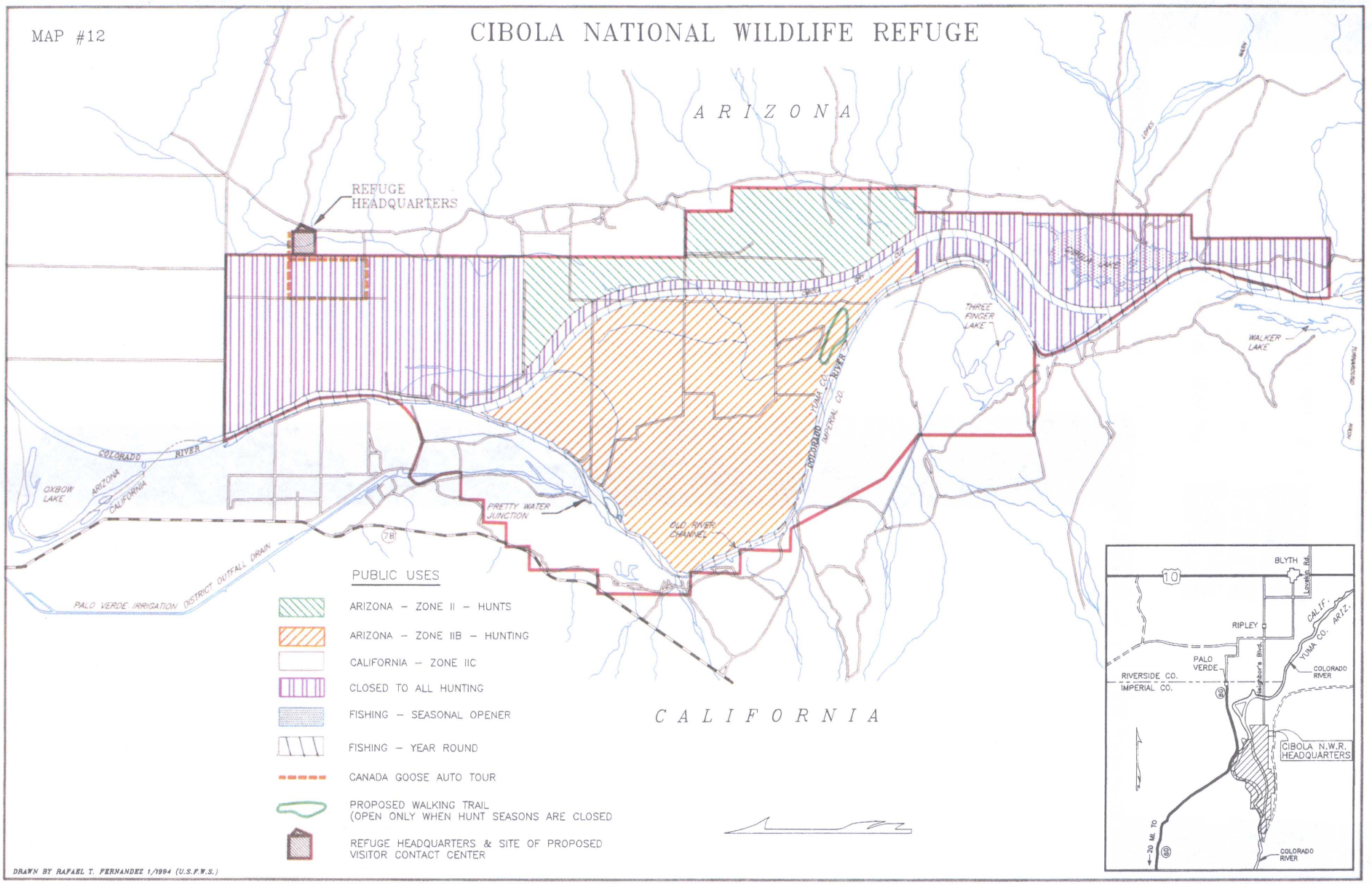
OPEN HUNTING / SEPTEMBER – MARCH FOR QUAIL, DOVE, COTTONTAIL AND BIGHORN SHEEP. THE AREA IS OPEN TO WILDLIFE OBSERVATION WHEN THE AREA IS CLOSED TO HUNTING.

FISHING

DRAWN BY RAFAEL T. FERNANDEZ 1/1994 (U.S.F.W.S.)

MAP #12

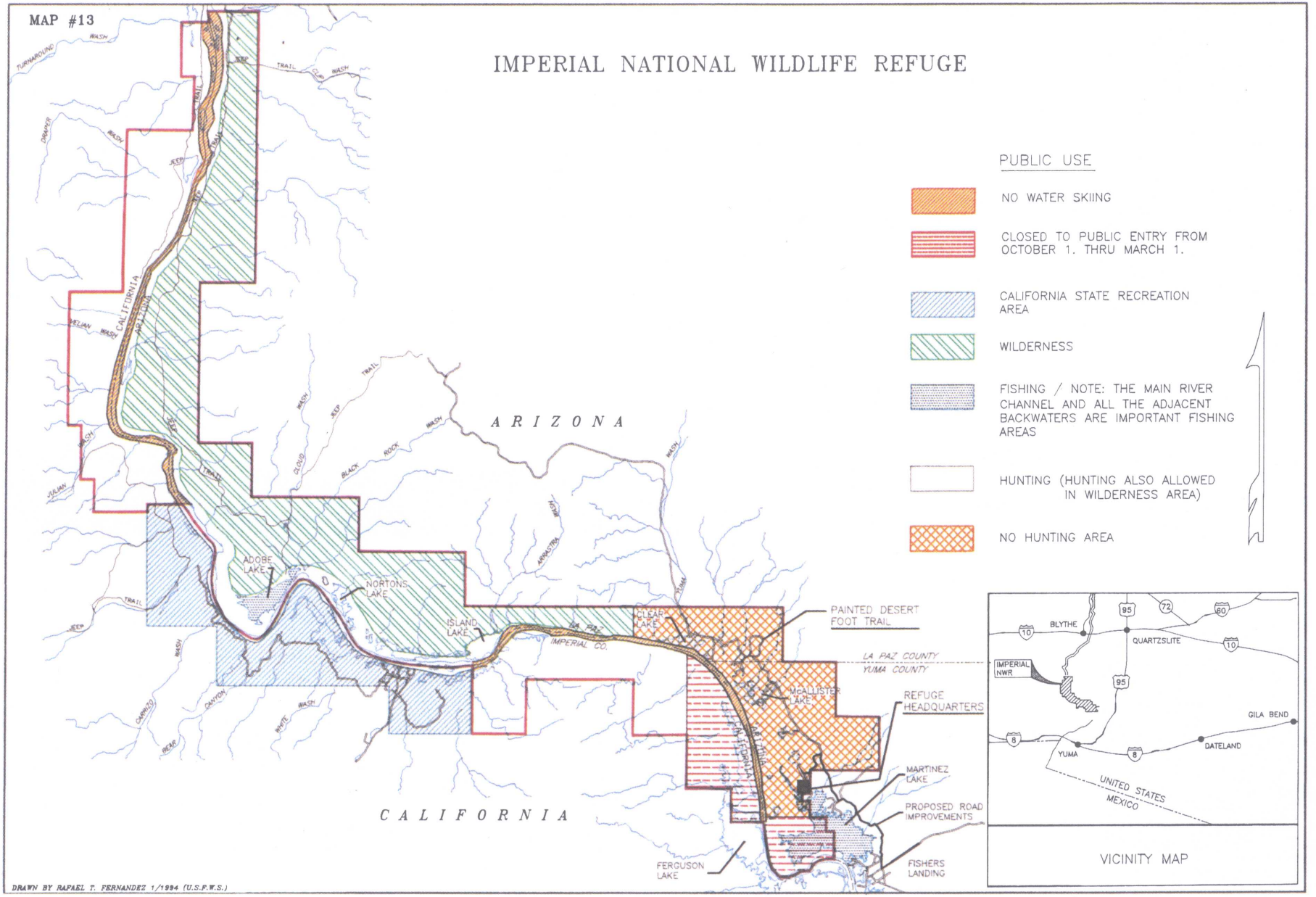
CIBOLA NATIONAL WILDLIFE REFUGE



DRAWN BY RAFAEL T. FERNANDEZ 1/1994 (U.S.F.W.S.)

MAP #13

IMPERIAL NATIONAL WILDLIFE REFUGE

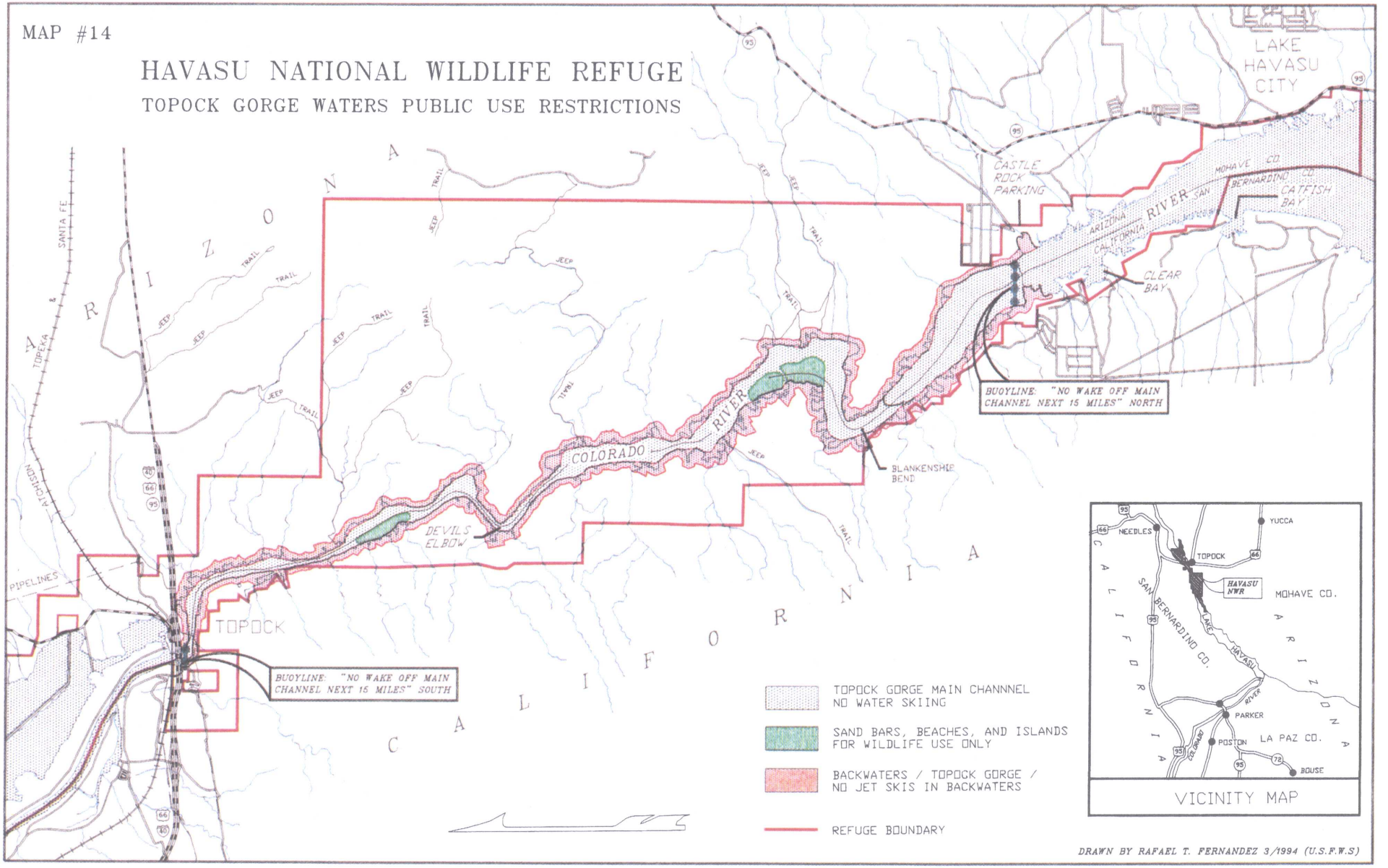


DRAWN BY RAFAEL T. FERNANDEZ 1/1994 (U.S.F.W.S.)

MAP #14

HAVASU NATIONAL WILDLIFE REFUGE

TOPOCK GORGE WATERS PUBLIC USE RESTRICTIONS



DRAWN BY RAFAEL T. FERNANDEZ 3/1994 (U.S.F.W.S)

INDEX

☆ U.S. GOVERNMENT PRINTING OFFICE: 1994—577-048